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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 9, NUMBER 1
JANUARY 1, 1976

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

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VOLUME 9, NUMBER 1
JANUARY 1, 1976

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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

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Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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ABSTRACT SOURCES

2. WATER CYCLE

2A. General

A HELE-SHAW ANALOG STUDY OF THE SEEPAGE OF GROUNDWATER RESTING ON A SLOPING BED,
Cambridge Univ., (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 2F.
W76-00025

SIMULATION OF WATER-AND VAPOR-DOMINATED HYDROTHERMAL RESERVOIRS,
Geological Survey, Reston, Va.
J. W. Mercer, and C. R. Faust.
Preprint of Paper SPE 5520, prepared for 50th Annual Fall Meeting, September 28-October 1, 1975, Dallas, Tex: Society of Petroleum Engineers of AIME Preprints, 1975. 16 p, 5 fig, 2 tab, 35 ref.

Descriptors: *Hydrothermal studies, *Reservoirs, *Model studies, *Water vapor, *Thermal water, Flow characteristics, Numerical analysis, Differential thermal analysis, Steam, Energy transfer.
Identifiers: *Geothermal reservoirs, *Thermal energy.

A two-dimensional (Areal), two-phase (Steam-water) model for the numerical simulation of both water-and vapor-dominated hydrothermal reservoirs describes transport of heat and flow of compressed water, steam-water mixtures, and superheated steam in a porous medium. The continuity equations for steam and for water are combined and, assuming that capillary pressure is negligible and that conditions of local thermal equilibrium prevail, are reduced to two nonlinear partial differential equations in which the dependent variables are fluid pressure and enthalpy. The mass transfer (Vaporization) terms are also eliminated when the continuity equations are combined. The two partial differential equations are solved simultaneously using a Galerkin-finite element technique for the spatial terms and finite-difference techniques for the temporal terms. The model is applied to example problems consisting of a hypothetical hot-water reservoir and a hypothetical two-phase reservoir. Model calculations are compared with calculations from other numerical work involving a finite-element model that is restricted to the flow of compressed water, and a finite-difference model that is restricted to the vapor-pressure curve (Steam-water mixtures). This numerical model can be used to evaluate both types of reservoirs. (Woodard-USGS)
W76-00087

THE HIGH PLAINS: PROBLEMS OF SEMIARID ENVIRONMENTS.
For primary bibliographic entry see Field 6D.
W76-00179

A MATHEMATICAL MODEL FOR FORECASTING THE FLOW OF THE SOLA RIVER,
Gdansk Technical Univ. (Poland).
E. Bobinski, T. Piwecki, and J. Zelazinski.
Hydrological Sciences Bulletin, Vol 20, No 1, p 51-60, March 1975. 5 fig, 2 ref.

Descriptors: *Model studies, *River forecasting, *Hydrograph analysis, Streamflow, Rainfall-runoff relationships, Optimization, Computer models, *Mathematical models.
Identifiers: *Sola River(Poland).

A rainfall-runoff conceptual deterministic model with lumped parameters simulating a runoff hydrograph of a mountainous river, having a catchment area of 780 sq km, was brought into service in 1973. The input consists of the rainfall amount and river flow values in the catchment area recorded on gauges every 3 hours for the previous 24 hours, and the quantitative precipitation forecast (QPF) for the next 24 hours. The output results are forecasted hourly values of river flow for the next 48 hours, given in three variants corresponding to the three following variants of the QPF: P sub 1=0; P sub 2=Pmax; P sub 1 less than P sub 3 less than P sub 2, where P sub 3 is given for input by the forecast meteorologist on duty and P sub 1 and P sub 2 are constants. The forecast refers to 24 hour precipitation total, the mean value for the catchment area. The forecast hydrograph is computed by the odra-1204 computer, with machine time of 8-15 minutes. Input and output data transmission are by teletype line. The identification of model parameters, the practical application of the model, and the results obtained were discussed. (Lardner-ISWS)
W76-00298

PRECIPITATION CONDITIONS RESULTING IN FLASH FLOODS AS RELATED TO THE FREQUENCY DISTRIBUTION OF INTERDIURNAL VARIATIONS OF THE SPECIFIC RUNOFF IN MINOR CATCHMENT AREAS UNAFFECTED BY MAN,
Meteorologischer Dienst der Deutschen Demokratischen Republik, Potsdam.
For primary bibliographic entry see Field 2E.
W76-00302

A REPRESENTATION OF THE EFFECTS OF TOPOGRAPHY ON SURFACE RAINFALL WITHIN MOVING BAROCLINIC DISTURBANCES,
British Meteorological Office, Brackness (England).
For primary bibliographic entry see Field 2B.
W76-00312

WATER BALANCE AND WATER RESOURCES IN CHINA,
Nanyang Univ., Singapore.
K-Y. Chen.
The Geophysical Magazine, Vol 37, No 2, p 519-522, December 1974. 7 fig, 6 tab, 19 ref.

Descriptors: *Water balance, *Water resources, Precipitation(Atmospheric), Climatology, Climates, Monsoons, Precipitable water, Water vapor, Arid lands, Humid areas, Arctic Ocean, Pacific Ocean, *Reviews.
Identifiers: *China, *Siberia, Convergence field, Mold rain, Plum rain, Abnormal precipitation, Aleutian low.

The problems of water balance and resources in Monsoon China from the viewpoint of climatology were reviewed, based on the papers which have been published in China. The following subjects were included: climatology of precipitation in China; the monsoon and precipitation in China; distribution of precipitable water over China; the transport of water vapor over China; the convergence field of water vapor over eastern China; Mei-yu (mold rain or plum rain) in China; abnormal precipitation in China; and arid and humid regions in China. The paper was a part of group study on water resources of monsoon Asia guided by Dr. M.M. Yoshino, University of Tasukuba, Japan, supported by the Japanese Ministry of Education in 1972 and 1973. (Roberts-ISWS)
W76-00314

SKEW INPUTS AND THE HURST EFFECT,
Ain Shams Univ., Cairo (Egypt).
For primary bibliographic entry see Field 4A.
W76-00317

RAIN RECORDINGS AS BASIS FOR THE DIMENSNIONING OF RIN RUNOFF SYSTEMS (REGENSCHREIBERAUFZEICHNUNGEN ALS GRUNDLAGE ZUR DIMENSIONIERUNG VON REGENWASSERABLEITUNGSALAGEN),
For primary bibliographic entry see Field 5B.
W76-00365

2B. Precipitation

MULTIPLICATION OF ICE PARTICLES IN SLIGHTLY SUPERCOOLED CUMULUS,
Manchester Univ. (England). Dept. of Mathematics.
R. F. Chisnell, and J. Latham.
Journal of the Atmospheric Sciences, Vol 32, No 4, p 863-866, April 1975. 10 ref.

Descriptors: *Cloud physics, *Model studies, *Ice, Precipitation(Atmospheric), Rime, Freezing, Clouds, Nucleation, Supercooling, Raindrops, Mathematical models, Meteorology.
Identifiers: *Ice particles, Riming, Splintering, Cumulus clouds.

A stochastic model of ice particle multiplication was outlined in which ice splinters are produced by riming and possibly also by the splintering of individual drops on freezing. The splinters may grow into rimers or be captured by supercooled drops, causing the drops to freeze and become rimers. The possibility of splinter-capture by supercooled drops reduces the average waiting time between the birth of a splinter and its subsequent development into a splinter-producing rimer. This reduction of the waiting time greatly enhances the growth rate of the ice particle population. In a particular calculation, with drops present, a multiplication factor of 10,000 is achieved in about 50 min if M sub p (the number of ice splinters ejected per unit mass of rime) is 1 per mg; this time is reduced to 10 min if we take the much higher values of about 140 found by other investigators. The corresponding times in the absence of drops were about 74 and 37 min respectively. (Sims-ISWS)
W76-00001

MEASUREMENT AND ANALYSIS OF VERY SHORT DURATION RAINFALL,
Asian Inst. of Tech., Bangkok (Thailand).
S. Pinkayan, and T. Ketratenaborvorn.
Hydrological Science Bulletin, Vol 20, No 1, p 87-91, March 1975. 3 fig, 4 ref.

Descriptors: *Rainfall, *Rainfall intensity, *Rain gages, Precipitation(Atmospheric), Frequency curves, Duration curves, Measurement, Analysis, Instrumentation, Meteorology, Climatology.
Identifiers: *Short duration intensities, *Thailand.

Hydraulic structures such as road culverts, bridge openings, and drainage systems of airfields and urban areas need to have an adequate capacity for flash floods. The peak of these flash floods from small catchment areas reach the drainage facilities after a very short duration of rainfall. Therefore, rainfall characteristics are the most important input to be used in estimation and prediction of floods from small basins. One method which can be used to obtain more information about the rainfall intensity is to record rainfall for a shorter time interval. This was done by changing the speed of chart drum from one revolution per day to 24 revolutions per day. The experiment was undertaken for a period of one year. The relationship was found between intensities of shorter durations and longer durations for this period. This relationship was used to estimate the rainfall intensity of short durations from the longer durations observed during the previous years of record. The rainfall intensities for durations of less than 5 minutes determined by the extrapolation of intensity-duration-frequency curves were lower than the rainfall intensities obtained from the combination of the records of previous years. The rainfall intensities for the durations of 1, 2, 3, and 4

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minutes were less than those obtained from the combined data by 10, 9, 7, and 4 percent, respectively. (Sims-ISWS)
W76-00002

REBOUND LIMITS ON CHARGE SEPARATION BY FALLING PRECIPITATION,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Physics.
C. B. Moore.
Journal of Geophysical Research, Vol 80, No 18, p 2658-2662, June 20, 1975. 4 fig, 3 tab, 12 ref. ONR N00014-67-A-0267-0009, NSF GA-43933 and GA-33372X2.

Descriptors: *Cloud physics, *Thunderstorms, *Hail, *Raindrops, Precipitation(Atmospheric), Crystals, Ice, Clouds, Model studies, Mathematical models, Laboratory tests, Meteorology.
Identifiers: *Charge separation, *Cloud electrification, Hail pellets, Particle collisions, Collision angles, Rebound probabilities.

Neglect of the sample dependence of rebound probabilities for cloud droplets colliding with hail pellets has led to an overestimate of the amounts of charge that can be separated with the Elster-Geitel mechanism. Application of wind tunnel results suggested that the actual amounts of charge transferred may be less than 20% that assumed by ignoring the angle dependence. Observations of the charges carried by hail and rain particles within the bases of thunderclouds supported these lower estimates and raised questions about the adequacy of the precipitation processes in explanations of thundercloud electrification. (Sims-ISWS)
W76-00009

REGIONAL DISTRIBUTION AND SEASONAL CHANGE IN PRECIPITATION VARIABILITY IN MONSOON ASIA,
Mie Prefectural Univ., Tsu (Japan).
M. Mizukoshi.
The Geophysical Magazine, Vol 37, No 2, p 175-184, December 1974. 4 fig, 26 ref.

Descriptors: *Monsoons, *Asia, *Rainfall, *Tropical regions, Variability, Rainfall disposition, Distribution patterns, Precipitation(Atmospheric), Seasonal, Pacific Ocean, Indian Ocean, Meteorology, Climatology.

Regional distribution of the precipitation variability and their seasonal variation were discussed for Monsoon Asia. Variabilities of annual and monthly precipitation were computed for 177 stations on the basis of the data of monthly and annual precipitation for the period 1931-1960. The area studied extends from 60 E to 180 E and from 10 N to 50 N. Major results were: (1) there are some regions in which the precipitation variabilities are very large or very small. For example, in most of the Indian Subcontinent and its surroundings, the variability of monthly precipitation exceeds 100%, except for the period June-August. In contrast, the equatorial areas and East Asia receive relatively constant precipitation; (2) distribution patterns of the precipitation variability change gradually from month to month. There are no abrupt seasonal changes in the pattern; (3) monthly distribution maps of variability show zonally extended patterns. Some zones of maximum and minimum variabilities were recognized. Drawing the axes of maximum and minimum variabilities, monthly positions of the axes were shown; (4) the zones of minimum variability coincide with ITCs and the Pacific polar frontal zones; and (5) the zones or axis of maximum and minimum variabilities shift their positions seasonally. (Sims-ISWS)
W76-00016

INTERANNUAL FLUCTUATIONS IN THE RAINFALL OF THE INDIA-EQUATORIAL PACIFIC REGION AND IN THE TROPICAL CIRCULATION,
Meteorological Research Inst., Tokyo (Japan).
I. Tsuchiya.
The Geophysical Magazine, Vol 37, No 2, p 163-173, December 1974. 8 fig, 1 tab, 13 ref.

Descriptors: *Monsoons, *Air circulation, *Tropical regions, *Rainfall, *Asia, *Indian Ocean, *Pacific Ocean, Circulation, Winds, Atmosphere, Precipitation(Atmospheric), Rainfall disposition, Variability, Wet seasons, Meteorology, Climatology.

As a result of analysis of the year-to-year variations of the winds at Mauritius Island in the Indian Ocean and at Canton Island in the Pacific Ocean during the period of 1962-1967, it was found that the strengths of southeast trade winds over the two oceans fluctuate in phase. The monsoon rainfall over the western slopes of the Indian Peninsula is plentiful in a year of strong southeast trade winds, while rainfalls of the islands in the equatorial Pacific dry zone are scanty. In reverse, we find drought weather over India and anomalous heavy rainfalls in the dry zone in a year of weak southeast trade winds. The Walker Circulation named by Bjerknes is a circulation model which explains large-scale rainfall distribution. (Sims-ISWS)
W76-00017

PERENNIAL SNOW COVERS, TINY GLACIERETS AND SNOW FIELDS IN JAPAN AS INDICES OF CLIMATIC FLUCTUATIONS,
Meteorological Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 2C.
W76-00018

PRODUCTION OF ICE CRYSTALS BY RIMING IN SLIGHTLY SUPERCOOLED CUMULUS,
British Meteorological Office, Bracknell (England).
B. J. Mason.
Quarterly Journal of the Royal Meteorological Society, Vol 101, No 429, p 675-679, July 1975. 2 tab, 11 ref.

Descriptors: *Cloud physics, *Model studies, *Ice, *Crystals, Rime, Freezing, Supercooling, Clouds, Nucleation, Raindrops, Mathematical models, Meteorology.
Identifiers: *Ice particles, Riming, Splintering, Cumulus clouds, Hail pellets.

It was shown that ice-crystal concentrations of order 10/litre may be produced in clouds limited to the -8 degree C level if growing pellets of soft hail release splinters at the rates recently observed in laboratory experiments and provided that these splinters can continue to grow in at least three successive thermals over a period of about 1.5 hours. (Sims-ISWS)
W76-00019

SOIL DETACHMENT FROM CLODS BY SIMULATED RAIN AND HAIL,
Agricultural Research Service, Manhattan, Kans.
For primary bibliographic entry see Field 2J.
W76-00030

INFLUENCE OF PRECIPITATION ON PERENNIAL GRASS PRODUCTION IN THE SEMIDESERT SOUTHWEST,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-00195

PROJECT SKYWATER, AN INTRODUCTION TO RIVERS IN THE SKY.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 3B.
W76-00288

SUMMARY OF SNOW SURVEY MEASURE MENTS FOR MONTANA, 1922-1974,
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 7C.
W76-00291

A STUDY OF EXTREME POINT RAINFAL OVER FLASH FLOOD PRONE REGIONS O THE HIMALAYAN FOOTHILLS OF NORT INDIA,
Institute of Tropical Meteorology, Poona (India).
O. N. Dhar, A. K. Kulkarni, and R. B. Sangam.
Hydrological Sciences Bulletin, Vol 20, No 1, 61-67, March 1975. 1 fig, 1 tab, 10 ref.

Descriptors: *Probable maximum precipitatio *Precipitation intensity, *Maximum probab flood, Precipitation(Atmospheric), Design floo Flood data, Flash floods, Estimating, Rainfa Cloudbursts, Rain, Precipitation exces Meteorological data, Hydrologic data, Weath data, Meteorology.
Identifiers: *India, Himallayan foothills, Extren rainfall.

In north India flash floods normally occur in t foothill and sub-montane regions of the Himalay during the monsoon months due to incidence heavy falls of rain. An attempt has been made estimate extreme rainfalls (Also called probab maximum precipitation) for stations in and ne the Himalayan foothills and sub-montane regio for longitude 75 E to 90 E. Only those stations the foothill regions with unbroken records of da rainfall for 60 to 70 years were selected. Hers field's latest statistical technique was used, a values of the frequency factor in the extreme rai fall equation for individual stations were obtain from the north Indian data. It was found that alo the Himalayan foothill regions extreme 1-day ra fall varies from 850 to 340 mm. The highest 1-d extreme rainfall of 850 mm was obtained for t Nagla station in the Nainital district in the K maon Hills, while the lowest value of 340 mm w obtained for the Kulu station in Kangra district Himachal Pradesh. It was also observed that t extreme rainfall is quite high in the outer footh regions of the Himalayas and decreases sharply one moves into the interior of the Himalayas. F the Himalayan foothill region under study, t ratio of the extreme 1-day rainfall to the highe observed 1-day rainfall over a period of 60 to years was found to be of the order of 2. (Sim ISWS)
W76-00299

THE MEASUREMENT OF HEAVY RAINFA OVER SMALL CATCHMENTS USING RADAR
British Meteorological Office, Brackn (England).
T. W. Harrold, C. A. Nicholass, and C. G. Collie
Hydrological Sciences Bulletin, Vol 20, No 1 69-76, March 1975. 7 fig, 1 tab, 2 ref.

Descriptors: *Rainfall, *Measurement, *Rad *Remote sensing, Rainfall intensity, Rainf disposition, Hydrologic data, Meteorological da Watersheds(Basins), *Small watersheds, Calib tions, Instrumentation, Meteorology.
Identifiers: *North Wales.

It was shown that radar-derived estimates heavy localized rainfall over sub-catchments area 20-100 sq km in hilly terrain in North Wa differ from optiumum estimates, based on d from a network of raingages, by an average 13% a calibration gauge is located within the su catchment of interest, or by 38% if there is calibration gauge--the average calibration from 18 month period being used instead. In order make accurate measurements over very sm areas (A few sq km), the radar should be wit about 35 km of the area of interest so that errors

the estimates of surface rainfall resulting from the horizontal movement of the rain as it falls from the radar beam to the ground are minimized. The radar system used in this study is now being modified so that data can be processed on site and transmitted in near real time to a nearby river control center. (Sims-ISWS)
W76-00300

SOME SMALL-SCALE CHARACTERISTICS OF EXTREME STORM RAINFALLS IN SMALL BASINS,
Agricultural Research Service, Beltsville, Md.
D. M. Hershfield.
Hydrological Sciences Bulletin, Vol 20, No 1, p 77-85, March 1975. 10 fig, 3 ref.

Descriptors: *Rainfall, *Storms, Time series analysis, Hydrology, Rainfall intensity, Watersheds(Basins), United States, Precipitation(Atmospheric), Precipitation gages, Precipitation intensity, Isohyets, Mapping, Correlation analysis, *Small watersheds.
Identifiers: *Rainfall pattern, Isochronal maps, Extreme rainfall.

Rainfall data from several flood-producing storms are used to illustrate some of the rainfall patterns in both time and space that have been observed. The data are from agricultural basins that vary in size from less than 1 to 1000 square miles and cover the climatic spectrum of the United States. The recording-raingage density varied from 13 per square mile in the smallest basin to 1 gage per 9 square miles in the largest basin. Storm isohyetal maps and isochronal maps of storm beginning times portrayed the complex areal patterns that are associated with extreme rainfalls. Cross-correlations and the mean of successive differences from series of short-duration rainfall increments, based on data from combinations of nearby stations, provided measures of time and areal variability. The series were composed of 2, 5, 10, 15, and 60-min rainfall increments. The largest observed storm rainfall differences over the shortest distances, based on a sample of 400 storms from 20 basins, ranged from 1 in for raingages separated by 0.1 mi to 8 in for gages separated by 9 mi. (Lee-ISWS)
W76-00301

A REPRESENTATION OF THE EFFECTS OF TOPOGRAPHY ON SURFACE RAINFALL WITHIN MOVING BAROCLINIC DISTURBANCES,
British Meteorological Office, Brackness (England).
C. G. Collier.
Quarterly Journal of the Royal Meteorological Society, Vol 101, No 429, p 407-422, July 1975. 7 fig, 4 tab, 14 ref.

Descriptors: *Rainfall, *Model studies, *Mathematical models, Precipitation intensity, Precipitation(Atmospheric), Orography, Forecasting, Simulation analysis, Rainfall disposition, Rainfall intensity, Rain, Meteorology.
Identifiers: *Baroclinic systems, *North Wales.

A numerical 'parameterization' model has been developed in order to predict precipitation amount over hilly terrain in North Wales. The model enables calculations to be made of the vertical velocity profile resulting from orographic and large-scale baroclinic effects at grid points one kilometer apart over an area of 2400 sq km. The precipitation falling on an area of 1000 sq km, and on areas of order 100 sq km within the larger area was predicted, using as the input to the model large-scale wind and humidity values derived from radiosonde ascents. Seven case studies were presented. All are examples of fast-moving baroclinic systems. This type of system was chosen to minimize the effects of non-orographic mesoscale or convective mechanisms, which are not parameterized in the present model. The mean error in the predicted rainfall over 1000 sq km was + or -10% and over 100 sq km about + or -20%. (Sims-ISWS)
W76-00312

RAIN RECORDINGS AS BASIS FOR THE DIMENSNIONING OF RIN RUNOFF SYSTEMS (REGENSCHREIBERAUFZEICHNUNGEN ALS GRUNDLAGE ZUR DIMENSIONIERUNG VON REGENWASSERABLEITUNGSALAGEN),
For primary bibliographic entry see Field 5B.
W76-00365

2C. Snow, Ice, and Frost

MULTIPLICATION OF ICE PARTICLES IN SLIGHTLY SUPERCOOLED CUMULUS,
Manchester Univ. (England). Dept. of Mathematics.
For primary bibliographic entry see Field 2B.
W76-00001

PERENNIAL SNOW COVERS, TINY GLACIERETS AND SNOW FIELDS IN JAPAN AS INDICES OF CLIMATIC FLUCTUATIONS,
Meteorological Research Inst., Tokyo (Japan).
I. Tsuchiya.
The Geophysical Magazine, Vol 37, No 2, p 147-161, December 1974. 12 fig, 1 tab, 15 ref.

Descriptors: *Snow cover, *Glaciers, *Snow surveys, Mountains, Snowmelt, Ablation, Snowpacks, Water resources, Firn, Ice, Snow, Precipitation(Atmospheric), Climatology, Melting, Meteorology.
Identifiers: *Japan.

There are many small but perennial snow covers in the mountains on the Japan Sea side of the Japanese mainland. Some of them survive two or more consecutive summers. Transformation process snow-glacial ice is more rapid than the case in the polar regions, and firn begins to turn into new ice at the end of its first ablation season. The perennial snow covers of snowdrift type may be used as a climatic index since their wax and wane reflect winter snowfalls and summer temperature. The depth of winter snow covers at 1300-1800 m mean sea level on the lee side slopes in some mountains of the Tohoku District often reaches 30-50 m. The survey of these is important in evaluating climatic fluctuations and water resources. (Sims-ISWS)
W76-00018

PRODUCTION OF ICE CRYSTALS BY RIMING IN SLIGHTLY SUPERCOOLED CUMULUS,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W76-00019

SUMMARY OF SNOW SURVEY MEASUREMENTS FOR MONTANA, 1922-1974,
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 7C.
W76-00291

2D. Evaporation and Transpiration

UPPER CARSON RIVER WATER STUDY, WATER YEAR 1973,
Nevada Agricultural Experiment Station, Reno.
J. C. Guitjens, and C. N. Mahannah.
Report R113, January 1975. 30 p, 9 fig, 2 tab, 14 ref, 7 append.

Descriptors: *Evapotranspiration, *Evaporation, *Soil moisture, *Nevada, Water table, Groundwater, Irrigation, Drainage, Withdrawal, Precipitation(Atmospheric), Rainfall, Temperature, Humidity, Evaporation pans, Measurement, Mathematical models, Agriculture, Water management(Applied).
Identifiers: *Carson Valley(Nev).

Mean annual pan evaporation from three study sites showed a decrease of more than 7 inches (from 63.7 to 56.2 inches) as compared to the previous water year of 1972. Potential evapotranspiration estimated by five theoretical models ranges from 36 inches for the Blaney-Criddle method with a variable crop coefficient to 59 inches for the Jensen-Haise method with a constant crop coefficient equal to one. All five theoretical methods showed increases compared to the previous water year of 1972. Assuming an annual pan coefficient of 0.7 for Carson Valley, the two-year mean of 60 inches of pan evaporation as measured at three sites would estimate an annual potential evapotranspiration of 42 inches. Seven irrigations, precipitation, and subirrigation at the Sarman Ranch produced only 11 inches of measured soil moisture additions; evapotranspiration and deep drainage produced only 21 inches of computed total soil moisture depletion. Presumably, high water tables contributed to a consistently high soil moisture content in the root-zone, a small air volume, and a relatively high use of water-table water for evapotranspiration. A similar but less pronounced phenomenon may have occurred at the Witt Ranch with an intermediate water-table. There were 23 inches of measured soil moisture additions and 37 inches of computed total soil moisture depletion. Evapotranspiration of water-table water could have occurred while the normally low water table was relatively high. The Heritage Ranch showed 37 inches of measured soil moisture additions and 46 inches of computed total soil moisture depletion. (Sims-ISWS)
W76-00006

COMPARISON OF EVAPORATION MEASUREMENTS USING DIFFERENT METHODS,
British Meteorological Office, Cambridge (England). Research Unit.
D. R. Grant.
Quarterly Journal of the Royal Meteorological Society, Vol 101, No 429, p 543-550, July 1975. 2 fig, 1 tab, 11 ref.

Descriptors: *Evaporation, *Barley, *Measurement, Energy budget, Lysimeters, Field crops, Neutron absorption, Anemometers, Rainfall, Radiation, Wind, Shear, Period of Growth, Instrumentation, Reliability.
Identifiers: *Bowen ratio, Aerodynamic method, Energy balance, Neutron moisture meter, Standard deviation.

Continuous measurements by five different methods were made of evaporation from barley during the 1971 growing season. The five methods were: (1) the Bowen ratio method, (2) the aerodynamic method, (3) use of the energy balance equation and the aerodynamic flux to obtain evaporation as the residue (the energy balance method), (4) a weighing lysimeter, and (5) a neutron moisture meter. Estimates were made of the error expected from each method and the results of the measurements were presented. Using the lysimeter and neutron probe as standards, the measurements confirmed that in a field of barley, when the Bowen ratio is usually small, the best method of measuring the daily evaporation throughout the whole growing season is the Bowen ratio method. The energy balance method is almost as good and has the advantage of not requiring humidity measurements. (Roberts-ISWS)
W76-00020

LIBRARY U. OF I. URBANA, ILLINOIS

INCLUSION OF PLANT MOISTURE STATUS IN COMBINATION-METHOD ESTIMATES OF PASTURE EVAPORATION,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
W. Shepherd.
Journal of Hydrology, Vol 26, No 3/4, p 199-207, August 1975. 3 fig, 1 tab, 10 ref.

Descriptors: *Evaporation, *Pastures, *Plant physiology, *Moisture, Energy budget, Moisture stress, Soil moisture, Grasslands.
Identifiers: *Pasture evaporation, Internal conductance, Moisture indexes, Penman, Pasture growth, Energy balance.

A combination-type formula for estimation of evaporation under conditions of restricted water supply was considered in earlier work. The formula involved an 'internal conductance' factor. Relationships of the conductance to indexes of moisture status of pasture species, determined over a range of soil-moisture conditions, was described here. Once established, these relationships were employed to estimate conductances, which were then used to determine evaporation over later periods of pasture growth. The investigations demonstrated that inclusion of plant-moisture stress data into a combination formula could afford estimates of pasture evaporation which were significantly better than those obtained by more empirical means. (Roberts-ISWS)
W76-00027

IMPROVEMENT OF WATER APPLICATION OF SELF-PROPELLED SPRINKLER IRRIGATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-00200

EVAPOTRANSPIRATION POSSIBLE NEW SEWAGE TREATMENT PROCESS.
For primary bibliographic entry see Field 5D.
W76-00221

AEROBIC DIGESTION AND EVAPOTRANSPIRATION IN HOME DISPOSAL SYSTEMS,
For primary bibliographic entry see Field 5D.
W76-00235

A SIMPLE METHOD FOR DIRECT MEASUREMENT OF EVAPORATION OF SOILS, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Bodenkunde.
J. Richter.
A Pflanzenernaehr Bodenkd., Vol 132, No 2, p 99-104. 1972.

Descriptors: *Evaporation, Soils, Measurement, Methodology, Analytical techniques.

A simple method to measure instantaneous undisturbed evaporation of soils is described. The technique is similar to that used for measurement of the CO2 surface penetrating flux. The possibilities and limitations of the method are discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-00448

2E. Streamflow and Runoff

QUANTITATIVE PREDICTION OF SEASONAL RATING CURVE SHIFTS,
National Weather Service, Kansas City, Mo. River Forecast Center.
C. B. Barrett.
Water Resources Research, Vol 11, No 4, p 526-532, August 1975. 7 fig, 4 tab, 15 ref.

Descriptors: *Rating curves, *Temperature, *Discharge(Water), *Missouri River, River beds, Water temperature, Discharge measurement, Streamflow, Stage-discharge relations, Sediments, Seasonal, Regime, Beds.
Identifiers: *Seasonal rating curves, Bed form, Stream width, Linear multiple regression techniques, Monthly rating curves, Low-flow regime rating, High-flow regime rating.

Application of linear multiple regression techniques to discharge measurement and water temperature data collected for selected Missouri River forecast points resulted in development of a successful quantitative technique for prediction of seasonal rating curve shifts. By utilizing 20 yr of discharge measurement and water temperature data for Omaha, Nebraska, and St. Joseph and Kansas City, Missouri, it was found that the addition of the independent variable water temperature to the stage-discharge relationship increased multiple correlation coefficients significantly. In all cases studied, increased temperature reflected an increase in stage for a constant flow. The maximum effect of water temperature was indicated for low flows. Water temperature is thought to cause the alterations of bed form configuration resulting in seasonal rating curve shifts. (Lee-ISWS)
W76-00026

CEDAR CREEK AT CEDARTOWN, GEORGIA--FLOOD FLOW CHARACTERISTICS AT BRIDGE SITE OF GEORGIA AVENUE RELOCATION (SUPPLEMENT TO OPEN-FILE REPORT 75-46),
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 4A.
W76-00084

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEPTEMBER 1973,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-00085

LOOP-RATING CURVES FOR VARIOUS UNSTEADY FLOWS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-00088

INDEX TO U. S. GEOLOGICAL SURVEY COMPUTER FILES CONTAINING DAILY VALUES FOR WATER PARAMETERS TO SEPTEMBER 30, 1971, NORTHEASTERN REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00097

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM OGEECHEE RIVER TO CARRABELLE RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00100

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 2. UPPER COLUMBIA RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00101

THE TERASSPERC-A PROPOSED SI UNIT FO THE FREQUENCY OF RECURRENCE OF HYDROLOGICAL EVENT,
Bradford Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 7A.
W76-00297

A MATHEMATICAL MODEL FOR FORECASTING THE FLOW OF THE SOLA RIVER,
Gdansk Technical Univ. (Poland).
For primary bibliographic entry see Field 2A.
W76-00298

PRECIPITATION CONDITIONS RESULTIN IN FLASH FLOODS AS RELATED TO TH FREQUENCY DISTRIBUTION OF INTERDIU NAL VARIATIONS OF THE SPECIFIC RUNOF IN MINOR CATCHMENT AREAS UNA FECTED BY MAN,
Meteorologischer Dienst der Deutsch Demokratischen Republik, Potsdam.
I. Spahn.
Hydrological Sciences Bulletin, Vol 20, No 1, 93-99, March 1975. 3 fig, 3 tab, 3 ref.

Descriptors: *Rainfall-runoff relationship *Runoff, *Rainfall, Flash floods, Frequen curves, Climatology, Precipitation(Atmospheric Floods, Hydrology, Surface runoff, Durati curves, Watersheds(Basins), *Small watershed Flood flow, Water management(Applied), Runo coefficient.
Identifiers: Small catchments.

The studies were carried out in catchment areas 50 to 150 sq km in the hills of the Germa Democratic Republic above an altitude of 500 The distribution of interdiurnal variations of t specific runoff of the two long-term series records 1916-1935 and 1946-1960 were used for objective selection of flood events of t hydrological summer season. The frequency di tributions of both these periods showed th between 1916 and 1960 there were no substanti variations in the runoff regime of the catchme areas, because of this the flood events under i vestigation were selected only from the second s ries (1946-1960). The related precipitation even have been investigated using precipitati recordings of duration, amount, and type. Floo can be expected in these catchment areas only the areal mean of precipitation exceeds 50 m with the associated duration varying between ju a few hours and three days. The purpose of the investigations was to develop the relation betwe runoff variations and the corresponding associat precipitation events for the period when t catchment areas are not influenced by man. T climatological analysis of the precipitation even may be used as a basis of the optimization of wat resources management and for prevention damage from floods. (Lee-ISWS)
W76-00302

FINITE ELEMENT SIMULATION OF FLOO HYDROGRAPHS,
Virginia Polytechnic Institute and State Univers ty, Blacksburg. Dept. of Agricultural Engineering
O. M. Judah, V. O. Shanholtz, and D. N.
Contractor.
Transactions of the American Society of Agricu tural Engineers, Vol 18, No 3, p 518-522, Ma June 1975. 6 fig, 1 tab, 21 ref.

Descriptors: *Finite element analysis, *Flo routing, *Numerical analysis, Overland flo Flood discharge, Mathematical studies, Mannin equation, Floods, Hydrographs, *Simulation ana ysis.
Identifiers: Kinematic wave approximation.

The distribution of overland flows has been st died extensively; the literature abounds wi discussion utilizing finite difference techniques

solve the unsteady flow equations. Little information is available on the use of finite element methods to solve surface water problems, despite extensive use in solving groundwater flow problems. Finite element techniques were used to develop a method for solving the one-dimensional, unsteady flow equation for overland and channel flows. The momentum equation was replaced by Manning's equation using the kinematic wave approximation. To demonstrate, flood hydrographs from actual watersheds were compared. (Jess-ISWS)
W76-00303

SIMPLE METHOD FOR MEASURING RELATIVE HUMIDITY, WATER AND AIR TEMPERATURES WITHIN A FEW MILLIMETERS OF WIND-GENERATED WATER WAVES,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 7B.
W76-00310

HYDRAULIC JUMP IN A ROUGH CHANNEL,
Toronto Univ., (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W76-00311

SKEW INPUTS AND THE HURST EFFECT,
Ain Shams Univ., Cairo (Egypt).
For primary bibliographic entry see Field 4A.
W76-00317

2F. Groundwater

GROUNDWATER GEOLOGY OF SOUTHWEST NEBRASKA GROUND WATER CONSERVATION DISTRICT,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 4B.
W76-00005

A HELE-SHAW ANALOG STUDY OF THE SEEPAGE OF GROUNDWATER RESTING ON A SLOPING BED,
Cambridge Univ., (England). Dept. of Applied Biology.
S. M. Marei, and G. D. Towner.
Water Resources Research, Vol 11, No 4, p 589-594, August 1975. 5 fig, 8 ref.

Descriptors: *Model studies, *Seepage, *Groundwater, *Slopes, Aquifers, Groundwater movement, Aquicludes, Dupuit-Forchheimer theory, Water table aquifers, Equations, Height, Ditches, Discharge(Water), Viscosity.
Identifiers: *Hele-Shaw models, *Sloping aquifers, Streamlines.

The analysis derived from an application of the Dupuit-Forchheimer approximations by Childs to the problem of flow of groundwater over sloping impermeable beds, in which it is assumed that the streamlines are parallel to the sloping bed rather than horizontal as previously assumed by Pavlovsky, was tested in a Hele-Shaw analog. Seepage rates and water table positions were measured for a range of slopes up to 30 degrees and with flow both up and down the slope. Considerably better agreement was found, especially at the largest slopes, by using the revised assumption. The theoretical seepage rates calculated from Childs' analysis also lay between the limits given by an exact analysis due to Youngs, in contrast to values calculated by using Pavlovsky's analysis which fell outside the limits for large flow rates. (Visocky-ISWS)
W76-00025

TRANSIENT WELL-FLOW IN AN UNCONFINED-CONFINED AQUIFER SYSTEM,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 4B.
W76-00029

EVALUATION OF A PROPOSED CONNECTOR WELL, NORTHEASTERN DESOTO COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W76-00095

INDEX TO U. S. GEOLOGICAL SURVEY COMPUTER FILES CONTAINING DAILY VALUES FOR WATER PARAMETERS TO SEPTEMBER 30, 1971, NORTHEASTERN REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00097

GROUND-WATER LEVELS IN THE UNITED STATES, 1968-72: NORTHEASTERN STATES.
Geological Survey, Reston Va.
For primary bibliographic entry see Field 7C.
W76-00098

ARIZONA GROUND WATER LAW: THE NEED FOR LEGISLATION,
Arizona Univ., Tucson. Coll of Law.
For primary bibliographic entry see Field 6D.
W76-00188

ENVIRONMENTAL IMPACTS OF SALINE SEEP IN MONTANA,
Western Interstate Commission for Higher Education, Boulder, Colo.
M. Harlow.
Montana Environmental Quality Council, Helena. 1975. 95 p, 12 fig, 6 tab, 3 append, 234 ref.

Descriptors: *Environmental effects, *Saline water systems, *Seepage, *Water pollution sources, *Saline water intrusion, Saline soils, Groundwater, Recharge, Discharge(Water), Subsurface drainage, Surface runoff, Drainage, Surface-groundwater-relationships, Air pollution, Montana.

Saline seeps are recently developed saline soils in nonirrigated areas that are wet some or all of the time, are frequently covered with a white salt crust, and where grass production is reduced or eliminated. 140,000 acres of cropland in Montana are already affected by saline seep, and the conditions could possibly affect a total of 17,000 square miles in the state. This report examines the geologic, climatic, and land use situations which have combined to produce saline seep. Of the four components of this condition, recharge, subsurface, discharge, and overland drainage, the last two affect the biosphere via the soil and surface water systems. Impacts of saline seep on ecosystems both at the discharge site and downstream are examined and alternatives for mitigation of the condition are presented and examined for their possible environmental impacts. Appendix material includes activities of the 1975 Montana legislature on saline seep problems in the state. (Michael-Arizona)
W76-00193

STEADY VERTICAL FLOWS IN SWELLING SOILS,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2G.
W76-00286

BIBLIOGRAPHY OF AVAILABLE GROUNDWATER INFORMATION IN OREGON,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 4B.
W76-00289

GROUND-WATER RECHARGE RATES FROM THERMOMETRY,
Agricultural Research Service, Fresno, Calif.
For primary bibliographic entry see Field 4B.
W76-00294

UPCONING OF THE SALT-WATER--FRESHWATER INTERFACE BENEATH A PUMPING WELL,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W76-00295

THE OCCURRENCE AND DEVELOPMENT OF GUEST SINK, HERNANDO COUNTY, FLORIDA,
Southwest Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 4B.
W76-00296

GROUNDWATER CONDITIONS IN THE PENRITH SANDSTONE AT CLIBURN, WESTMORLAND,
Institute of Geological Sciences, London (England). Dept. of Hydrological.
For primary bibliographic entry see Field 4B.
W76-00309

GROUND WATER GEOCHEMISTRY OF THE PAHASAPA LIMESTONE,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 2K.
W76-00375

PALEOHYDROLOGY OF THE CAVES IN THE MORAVSKY KRAS (MORAVIAN KARST),
Ceskoslovenska Akademie Ved, Brno. Geograficky Ustav.
J. Pribyl.
Studia Geographica 28, Brno, 1973, 64 p, 4 tab, 19 fig, 95 ref.

Descriptors: *Paleohydrology, *Caves, *Geology, *Karst, *Karst hydrology, Limestones, Quaternary period, Sedimentation, Paleoclimatology, Geomorphology.
Identifiers: *Speleology, *Moravian Karst, *Czechoslavakia, Cave sedimentation.

The Moravian Karst is located northwest of Brno, Czechoslovakia. The northern area of the Karst forms part of a belt of Devonian limestones that is 3 to 5 km wide and 25 km long. The geology of the region is explained and the paleogeographical development is described from the Lower Devonian to the present. Study methods include sedimentological, speleological and hydrological research and are reviewed in detail. There is a great variety in the sedimentary fillings of the caves of the Moravian Karst, and these are thoroughly described and divided into facies. The northern part of the Moravian Karst is divided into several regions, among them the Sloup region, the Holstejn region, and the Ostrov region. The individual caves in each area are sedimentologically described in order to determine the development of the cave systems. Three main stages of development in the Quaternary have been distinguished from the sedimentological cycles. (Bradbeer-NWWA)
W76-00394

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ELECTROMAGNETIC DEPTH SOUNDING FOR GROUND WATER EXPLORATION IN RESISTIVE FORMATIONS,
Indian Inst. of Tech., Kharagpur. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 4B.
W76-00398

THEORY AND APPLICATION OF THE SKIN EFFECT CONCEPT TO GROUND WATER WELLS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-00399

PARTIALLY PENETRATING WELL IN A CONFINED AQUIFER,
Osmania Univ., Warangal (India). Regional Engineering Coll.
For primary bibliographic entry see Field 8B.
W76-00400

STUDIES ON A WELL PENETRATING A TWO-AQUIFER SYSTEM,
Indian Inst. of Tech. Madras.
For primary bibliographic entry see Field 8B.
W76-00401

A MATHEMATICAL APPROACH TO SOME ASPECTS OF GROUND WATER FLOW IN HARD ROCK AREAS,
Ground Water Inst., Poona (India).
For primary bibliographic entry see Field 4B.
W76-00402

SOME HYDROGEOPHYSICAL PROPERTIES OF THE BUNTER SANDSTONE OF NORTHWEST ENGLAND,
Birmingham Univ. (England).
R. D. Barker, and P. F. Worthington.
Geoexploration, Vol 11, No 3, p 151-170, September, 1973. 18 fig, 1 tab, 22 ref.

Descriptors: *Hydrogeology, *Geophysics, *Seismic studies, *Porosity, *Permeability, *Sandstone, Aquifer properties, Resistivity, Groundwater, *Aquifer characteristics.
Identifiers: *Bunter sandstone, *Seismic velocity, England.

Laboratory investigations of the Bunter Sandstone (a principal source of ground water in the United Kingdom) from the Fylde area of Lancashire have been made including density and porosity, intergranular permeability, electrical resistivity, and seismic velocity. Marked correlations developed between porosity, formation resistivity factor, and seismic velocity. The dependence of intergranular permeability on these three quantities is less well defined but significant. These relations apply specifically to this sandstone in the Fylde area but may be generally applicable to the Bunter sandstone in other areas. The easiest field application of this study is the estimation of sandstone porosity and permeability from seismic velocity. (Bradbeer-NWWA)
W76-00413

GROUND WATER CONDITIONS IN GREATER TEHRAN,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 4B.
W76-00414

THE USE OF RESISTIVITY LOGGING TO ESTIMATE BOREHOLE YIELD FROM A MATRIX-CONDUCTING SANDSTONE,
Birmingham Univ. (England).
For primary bibliographic entry see Field 4B.
W76-00419

SALINE GROUND WATERS IN THE CARBONIFEROUS ROCKS OF THE ENGLISH EAST MIDLANDS IN RELATION TO THE GEOLOGY,
Water Resources Board, Reading (England).
R. A. Downing, and F. Howitt.
Quarterly Journal of Engineering Geology, Vol 1, No 4, p 241-269, June, 1969. 12 fig, 3 tab, 25 ref.

Descriptors: *Aquifer, *Saline water, *Geology, *Saline aquifer, Limestones, Coal, Salinity, Groundwater, Chemistry, Rocks, Carbonate rocks.
Identifiers: *Carboniferous rocks, Coal measures, Millstone Grit, *East Midland(England), Origin, Source, Genesis.

The Carboniferous system in the East Midlands is comprised of a limestone-shale series or a massive limestone (the Carboniferous Limestone) overlain by a cyclic sequence of sandstones, mudstones, seat earths, and coals (the Millstone Grit and Coal Measures). The geology is briefly described and new correlations of the Millstone Grit and the Lower Coal Measures are introduced. Most of the ground water discussed is saline with total concentration ranging up to 246,000 mg/l. The concentration in all formations increases from southwest to northeast and the variation in ionic content associated with this increase is discussed. The ground waters are probably from the diagenesis of Carboniferous marine and brackish waters and possibly some Permian marine waters, most likely concentrated by argillaceous beds acting as semi-permeable membranes. It is suggested that the increase in Ca/Cl and Mg/Cl ratios as the total ionic concentration increases is due to the selective concentration of calcium and magnesium ions by argillaceous beds. In the southwest and south of the East Midlands the saline water has been diluted, probably by meteoric water moving through the aquifers from the outcrop areas and discharging into Permo-Triassic rocks, where these overlie Carboniferous aquifers at depth in the southeast of the region. (Campbell-NWWA)
W76-00488

2G. Water In Soils

SOIL MOISTURE AVAILABILITY AND MOVEMENT,
Nevada Univ., Reno. Cooperative Extension Service.
W. W. Miller.
Report C161, March 1975. 8 p, 6 fig.

Descriptors: *Soil moisture, *Soil water movement, *Moisture availability, *Soils, Saturation, Field capacity, Wilting point, Moisture tension, Storage capacity, Evaporation.

Plants drew water from the soil between irrigations or periods of rainfall. Approximately half of the volume of soil is pore space which may be filled with water or air. The soil properties most important to the water supply of plants are: (1) the moisture storing capacity of soil, (2) the availability of this moisture to plants, and (3) the rate of movement of water into and within the soil. Each of these properties is related directly or indirectly to the size and shapes of soil pore spaces. An introductory explanation of these properties was provided and related terminology was defined. (Sims-ISWS)
W76-00007

RATES OF WATER ENTRY INTO THE SUBSOIL OF SEVERAL SOIL SERIES IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 5D.
W76-00008

IN SITU HYDRAULIC CONDUCTIVITY A FOUR HILLSLOPE LOCATIONS IN A CLOSE DRAINAGE SYSTEM,
North Dakota State Univ., Fargo. Dept of Soils.
K. D. Matzdorf, D. K. Cassel, B. K. Worcester, and D. D. Malo.
Soil Science of America Proceedings, Vol 39, N 3, p 508-512, May-June 1975. 6 fig, 2 tab, 12 ref.

Descriptors: *Hydraulic conductivit *Infiltration, *Glacial soils, *North Dakota, Ti Slopes, On-site investigations, Soil water mov ment, Soil water, Tensiometers, Soil physical pr perties, Irrigation, Groundwater movement, U saturated flow, Moisture content, Agronomy.
Identifiers: *Soil water content, Toposequence.

Virtually no information has been published co cerning the hydraulic properties of large acrea of till plain soils associated with 'potholes' northcentral United States and Canada. Obje tives of research were to measure and compare situ hydraulic conductivities and selected s physical properties at several depths in four s profiles on a till plain in southeastern No Dakota. Theoretical hydraulic conductivity valu were calculated and compared with the in situ co ductivities. Unsaturated soil hydraulic conducti ty vs. depth was measured in situ at four sites o toposequence developed from a glacial till. Wa was allowed to infiltrate the soil at each site a the soil surface covered to prevent evaporati During the ensuing drainage periods soil wa pressure was monitored with triplicate tensionm ters at each of six depths. These depths w selected on the basis of soil morphology. S water characteristics, determined on triplicate 7 by 7.6-cm cores taken from the same depth as tensiometers cups, were used in conjunction w soil water pressure data to compute hydraulic c ductivities. Hydraulic conductivity generally creased with depth to about 90 cm. Below t depth, hydraulic conductivity tended to decrea When the matching factor was selected from midpoint of the measured hydraulic conductiv range, the conductivities computed by Green Corey's method compared favorably with th measured in situ. (Sims-ISWS)
W76-00023

VALIDITY OF SOIL-WATER SAMPLES CO LECTED WITH POROUS CERAMIC CUPS,
Forest Service (USDA) Cadillac, Mich. No Central Forest Experiment Station.
For primary bibliographic entry see Field 5A.
W76-00024

WATER INTAKE UNDER CENTER-PIVO FROM TIME-VARYING APPLICATI RATES,
Nebraska Univ. Lincoln. Dept. of Agricultural gineering.
For primary bibliographic entry see Field 3F.
W76-00031

SIMULTANEOUS TRANSPORT OF WAT AND ADSORBED SOLUTES THROUGH S UNDER TRANSIENT FLOW CONDITIONS,
Oklahoma State Univ., Stillwater. Dept. Agronomy.
J. M. Davidson, D. R. Baker, and G. H. Brusew
Transactions of the American Society of Agri tural Engineers, Vol 18, No 3, p 535-539, M June 1975. 4 fig, 24 ref. EPA S-1366, EPA 800364.

Descriptors: *Infiltration, *Solutes, *Adsorpt *Soil water, Soil filters, Model studies, Ma matical studies, Soil water movement, Aque solutions, Pollutants, Water pollution treatm Subsurface waters, Zone of aeration.
Identifiers: Solute transport.

The simultaneous transfer of water and sol through a soil under natural field condition

generally a transient process. The direction and rate at which each of these phases move are dependent upon many factors, including the physical characteristics of the soil, climatic conditions, plant and microbial activity, and interactions between the solute and soil matrix. An understanding of how these pprocesses influence the transfer of each phase is essential in the development of agricultural management practices for minimum contamination to soil and water supplies and the efficient use of irrigation water and fertilizers. A set of differential equations for water and interacting and noninteracting solute transport were solved simultaneously for transient and steady state soil water conditions using a finite difference scheme. The solutions used independently measured soil and soil-solute adsorption-desorption characteristics to describe the movement of a solute in a soil profile. Numerical dispersion in the finite difference solution of the solute transport equation was considered and a correction included in the solution. Experimental results from a laboratory study were used to test the numerical solution's ability to describe the movement and distribution of a herbicide in a soil profile with time. A natural field problem involving infiltration and evaporation was simulated and discussed. The agreement between laboratory and calculated water and herbicide distributions was good. (Sims-ISWS)
W76-00032

CORRELATED CHANGES OF ENZYMATIC ACTIVITY IN SOILS OF VERTICAL ZONES, (IN RUSSIAN),
S. A. Aliev, and D. A. Gadzhiev.
Biol Nauki., Vol 16, No 5, p 121-126, Illus, 1973.

Descriptors: *Enzymes, *Soils, Humus, *Temperature, *Organic matter, *Microorganisms, Sierozems.
Identifiers: Catalase, *Enzymatic activity, Invertase, Phosphatase, Protease, Polyphenol oxidase, *USSR, Nakhichevan ASSR, Chernozems.

The activity of invertase, phosphatase, protease, catalase and polyphenol oxidase in relation to the temperature and water conditions, abundance of microorganisms, and content of organic matter in soils of vertical zones of Nakhichevan ASSR (primitive sierozems, sierozems, and chestnut and mountain chernozems) was investigated. Enzyme activity increased with an increase of the number of microorganisms and content of humus and decreased markedly as soil moisture decreased. The activity of individual enzymes was maximum for different combinations of the temperature and water conditions. The optimal temperature and moisture content of the soils for manisfestation of the activity of the enzymes were, respectively, 12-18C and 18-25% for invertase, 14-20 degrees and 20-30% for phosphatase, 20-25 degrees and 20-25% for protease, 12-18 degrees and 20-25% for catalase, and 18-25 degrees and 15-25% for polyphenol oxidase. A further increase of temperature was accompanied by an increase of the shortage of soil moisture, which caused a marked drop of enzymatic activity. At a low temperature and increase of soil moisture the activity of the enzymes decreased insignificantly.--Copyright 1974, Biological Abstracts, Inc.
W76-00044

BIOLOGICAL CIRCULATION OF SALTS IN SALINIZED SOILS OF GEORGIAN SSR, (IN RUSSIAN),
V. I. Chkhikvishvili.
Soobshch Akad Nauk Gruz SSR. Vol 70, No 1, p 165-168. 1973.

Descriptors: *Saline soils, Salts, *Halophytes, Evaporation, Salt marshes, Path of pollutants, Water pollution sources.
Identifiers: *Biological circulation(Salts), *Georgian-SSR, *USSR.

Saline ground waters occuring above the critical level played the leading role in the salinization of soil in the Alazani and other poorly drained plains and drainless depressions of eastern Georgia (USSR). The amounts of readily soluble salts involved in the annual cycle reach an average of 50 to 100 t/ha as a result of direct evaporation and 1.5 to 2 t/ha through halophytes. The biological circulation of salts is of great importance in the salinization of the steppe salt marshes of Kvemo-Kartli and Kakheti. This is confirmed by the analyses of high-ash substances of the overground-and underground parts of halophytes.--Copyright 1974, Biological Abstracts, Inc.
W76-00081

THE RELATIONSHIP BETWEEN SOLAR RADIATION, SOIL WATER, AND WATER POTENTIAL OF EARS OF WHEAT,
Lincoln Coll. (New Zealand). Dept. of Plant Science.
For primary bibliographic entry see Field 3F.
W76-00150

FINITE ELEMENT SOLUTIONS FOR UNSTEADY AND UNSATURATED FLOW IN POROUS MEDIA,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 764, $3.75 in paper copy, $2.25 in microfiche. California Water Resources Center, Davis Completion Report, Contribution No 151, August 1975. 25 p, 10 fig, 39 ref. (California Water Resources Center Porject UCAL-WRC-W-336) OWRT A-039-CAL (10).

Descriptors: *Finite element analysis, *Unsteady flow, *Unsaturated flow, *Porous media algorithms, Diffusivity, Infiltration, Soil water, Capillary conductivity, Equations, Numerical studies, Mathematical studies.

A finite element, weighted residual, successive substitution algorithm has been used to solve two-dimensional infiltration problems whose governing partial differential equation and boundary conditions are highly non-linear. The results compared favorably with other published numerical solutions to similar examples. The soil water diffusivity as well as the capillary conductivity, were approximated within a finite element in terms of shape functions and discretized values of these functions calculated using guessed values or previously calculated values at a certain time level of the water content at the nodes. This successive substitution scheme converged rapidly within each time step. The method is general and can be extended to three-dimensional flows and the use of higher order approximations. The nonlinear equations describing the unsteady and unsaturated, one-dimensional flow in porous media have also been investigated. Use was made of the finite element method employing a weighted residual with a linear shape function and two-dimensional elements in space and time. Results were obtained for both traingular and rectangular elements, as well as several forms of the field parameters (capillary conductivity and soil water diffusivity). These results compared very favorably with the results of other investigators who used different techniques for obtaining solutions. (Snyder-California, Davis)
W76-00177

THE EFFECTS OF CLIMATE ON WATER USE IN CANTERBURY IRRIGATION SCHEMES,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
P. D. Fitzgerald.
Technical Report 8, 1974. 20 p, 5 fig, 10 tab, 3 ref.

Descriptors: *Climatology, *Irrigation programs, *Water requirements, *Soil-water-plant relationships, *Moisture deficit, Arid lands, Water utilization, Water conservation, Water management(Applied), Soil moisture, Irrigation practices, Consumptive use, Irrigation water, Precipitation(Atmospheric), Moisture uptake, Moisture content, Water balance, Land use, Droughts, Rainfall.
Identifiers: *Winchmore(New Zealand).

The main form of irrigation is the border method. Water used, irrigation area, land preparation cost, and rainfall data were analyzed to derive average application depths of irrigation water and the percentage of total area for irrigation. Results indicate that average depth of water application is related both to seasonal rainfall and number of drought days. Experiments at Winchmore suggest that the amount of water applied at irrigation is about 3 times that needed to correct the deficit. (Robinett-Arizona)
W76-00194

STEADY VERTICAL FLOWS IN SWELLING SOILS,
Arizona Water Resources Research Center, Tucson.
G. Sposito.
Water Resources Research, Vol 11, No 3, p 461-464, June 1975. 1 fig, 19 ref.

Descriptors: *Expansive soils, *Steady flow, *Porous media, *Evaporation, Expansive clays, Darcys law, Hydraulic conductivity, Permeability, Flow rates, Water table.
Identifiers: *Swelling soils, *Vertical flows, *Steady vertical flows, Isothermal, Isohaline, Steady evaporation, Bare soil.

A thermodynamic description was presented of the isothermal, isohaline steady vertical flow of water in a swelling porous medium. An expression for the rate of steady flow was derived which was a straighforward generalization of well-known results in standard flow theory but which differed considerably from an equation derived previously by Philip to describe the same process. This difference, aside from changes in notation, was shown to be the artifact of an error in procedure. An application of the flow equation derived was made to a simple model of steady evaporation from a bare soil containing a shallow water table. A significant result of the calculation was that the standard flow theory, applicable only to non-swelling porous media, will always under- estimate the rate of evaporation when it is applied to a swelling porous medium. (Sanderson-ISWS)
W76-00286

THE UTILITY OF SURFACE TEMPERATURE MEASUREMENTS FOR THE REMOTE SENSING OF SURFACE SOIL WATER STATUS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, T. J. Schmugge, R. D. Jackson, and R. J. Reginato.
Journal of Geophysical Research, Vol 80, No 21, p 3044-3049, July 20, 1975. 8 fig, 9 ref.

Descriptors: *Soil temperature, *Soil water, *Soil surfaces, *Measurement, Soil moisture, Radiation, *Remote sensing, Temperature, Profiles, Water, Soils, Pressure, Soil types, Moisture tension, On-site investigations, Loam.
Identifiers: Correlation.

Experiments carried out on an Avondale loam soil indicated that the thermal inertia concept of soil water content detection was reasonably sound. The volumetric water contents of surface soil layers between 2 and 4 cm thick were found to be linear functions of the amplitude of the diurnal surface soil temperature wave for clear day-night periods. They were also found to be linear functions of the daily maximum value of the surface

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soil-air temperature differential. Tests on three additional soils ranging from sandy loam to clay indicated that the relations determined for Avondale loam could not be accurately applied to these other soil types. When the moisture characteristic curves of each soil were used to transform water contents into pressure potentials, however, it was found that soil water pressure potential could be determined without prior knowledge of soil type, and thus its value as a potential soil water status survey tool was significantly enhanced. (Adams-ISWS)
W76-00305

LEAD, ZINC, AND COPPER IN SOILS OF URBAN STORM-RUNOFF RETENTION BASINS,
Agricultural Research Service, Fresno, Calif. Water Management Research.
For primary bibliographic entry see Field 5A.
W76-00307

TRACE ELEMENTS IN CORN GROWN ON LONG-TERM SLUDGE DISPOSAL SITE,
National Environmental Research Center, Cincinnati, Ohio, Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5B.
W76-00359

FORECASTING THE OCCURRENCE OF WIND EROSION OF SOIL, (IN RUSSIAN),
Volgograd Agricultural Inst. (USSR).
For primary bibliographic entry see Field 2J.
W76-00362

POSSIBILITIES OF WASTE WATER IRRIGATION IN FORESTS (MOEGLIHCKEITEN DER ABWASSERVERREISELUNG IN WALD-BESTAENDEN),
Goettingen Univ. (West Germany).Inst. of Soil Science and Forest Nutrition.
For primary bibliographic entry see Field 5D.
W76-00366

MOVEMENT OF TRACE METALS WITH PERCOLATING WATER,
Rhode Island Univ., Kingston. Dept. of Civil Engineering; and Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W76-00374

A SIMPLE METHOD FOR DIRECT MEASUREMENT OF EVAPORATION OF SOILS, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 2D.
W76-00448

THE EFFECT OF SOIL MOISTURE ON CONTENT OF VARIOUS FRACTIONS OF PROTEIN NITROGEN IN PLANTS, (IN AZERBAIJANIAN),
For primary bibliographic entry see Field 3F.
W76-00450

BRAKING FEEDLOT RUNOFF.
For primary bibliographic entry see Field 5G.
W76-00462

PREDICTION OF PLANT RESPONSE TO FERTILISERS BY MEANS OF SOIL TESTS,
Department of Agriculture, Mosgiel (New Zealand). Invermay Agricultural Research Center.
For primary bibliographic entry see Field 3F.
W76-00491

2H. Lakes

GEOCHEMISTRY AND NATURAL IONIC AND ISOTOPIC TRACING; TWO COMPLEMENTARY WAYS TO STUDY THE NATURAL SALINITY REGIME OF THE HYDROLOGICAL SYSTEM OF LAKE CHAD,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
M-A. Roche.
Journal of Hydrology, Vol 26, No 1/2, p 153-171, July 1975. 7 fig, 1 tab, 28 ref.

Descriptors: *Lake basins, *Hydrologic systems, *Water chemistry, *Isotope studies, *Saline lakes, Groundwater, Geochemistry, Lakes, Lake sediments, Salinity, Ions, Chemical analysis, Cations, Chromatography.
Identifiers: *Lake Chad, *Isotope tracing, *Biorhexistasy, Chemical budget.

As a consequence of intense evaporation and transit through a succession of sedimentary traps (flood plains, lake, dune aquifer, and interdune depression), the isotopic composition and the characteristics of the dissolved and suspended loads of Lake Chad water change downstream in a regular manner resembling chromatography. The migration of the water and chemical constituents from one end to the other of this endorheic basin, extending from the humid tropics to the desert margins, was outlined and quantified. The erosion, transport, and sedimentation phenomena and the natural saline and isotope tracing methods were studied simultaneously. It was illustrated that these two avenues of research are complementary, justifying the use of common models, and the indispensable to each other. (Prickett-ISWS)
W76-00028

RECIPIENT INVESTIGATION IN THE LAKE GLAFSFJORDEN,
For primary bibliographic entry see Field 5C.
W76-00058

INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS OF THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
L. T. Crook.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 105-160, 1975. 7 fig, 7 tab, 1 append.

Descriptors: *Great Lakes, *Limnology, *Model studies, *Planning, *Feasibility studies, *Evaluation, *Water resources development, Programs, Data acquisition, Water management(Applied), Methodology, Comprehensive planning, Rivers, Simulation analysis, Systems analysis.
Identifiers: *Interdisciplinary analysis.

The Great Lakes Basin Commission's feasibility study of the mathematical modeling capabilities of the current state-of-the-art for planning in the Great Lakes is discussed. The Commission decided to restrict its systems analysis effort to the limnological aspects of the Great Lakes and exogenously introduce the socio-economic factors and levels of resource-per-capita-use factors. This paper describes the limnological systems, identifies the methodological approach, reports on the water resource problems, variables and data requirements, evaluates the state-of-the-art of available models and their interrelationships and adaptability to planning problems within the Great Lakes, discusses model synthesis for planning needs, and gives conclusions and recommendations of Phase I of the study and the objectives and management structure proposed for Phase II. The levels of modeling feasibility of a series of planning categories are analyzed for quantitative evaluation on the basis of the availability of data, quality of models, and requirements for planning. The objective of the proposed main limnological systems and analysis program, appended for reference, is to develop models of the physical, chemical and biological processes in the Great Lakes in sufficient detail to enable planners, engineers and economists to assess the consequences of alternative planning and resource development strategies. (See also W76-00060) (Bell-Cornell)
W76-00067

DISCUSSION (OF, 'INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS O THE GREAT LAKES' BY L. T. CROOK),
State Univ. of New York at Albany. Dept. o Biological Sciences.
D. C. McNaught.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems University of Colorado, Boulder, June 19-22 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17 3.72-4, New York, NY, p 161-170, 1975. 2 equ.

Descriptors: *Great Lakes, *Limnology *Planning, *Model studies, *Water quality *Eutrophication, Ecosystems, Management Equations, Zooplankton, Phytoplankton, Lake Ontario, Biomass, Resource allocation, Aquatic environment, Simulation analysis, Systems analysis.
Identifiers: Great Lakes River Basin Commission Prediction, Lake George(N.Y.).

Models of limnological systems must have predictive capabilities to be useful for planning or for developing new ecological concepts. Models of the major biotic components of the ecosystem, such as those described by L. T. Crook, can be validated. Furthermore, their application in planning is readily demonstratable: some of these models are easily perturbed, making it possible to predict changes in the numerical abundance of various types of organisms with increased eutrophication. Specifically addressed herein are the ranking problems of the Great Lakes: (1) eutrophication; and (2) water quality. These problems can be examined in the context of the biotic characteristics of these great aquatic systems or from the viewpoint of their management. Considered are the origin and validation of a zooplankton model, observations on Lake Ontario, a resource allocation model for zooplankton which predicts composition, and validation and perturbation analysis of the resource model. In conclusion, simple process models describing primary and secondary production in the Great Lakes can be coupled to provide realistic estimates of production following perturbation of these aquatic ecosystems. The author generally supports Phase II of the Limnological Systems Analysis discussed by Crook. (See also W76-00060) (Bell-Cornell)
W76-00068

DISCUSSION (OF, 'INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS O THE GREAT LAKES,' BY L.T. CROOK),
Resource Management Associates, Lafayette Calif.
G. T. Orlob.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource System University of Colorado, Boulder, June 19-2 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/1 3.72-4, New York, NY, p 171-193, 1975. 5 fig, equ, 4 ref.

Descriptors: *Lakes, *Ecosystems, *Model studies, *Simulation analysis, *Planning, *Gre

Lakes, Evaluation, Management, Constraints, Aquatic environment, Mass transfer, Limnology, Reservoirs, Biology, Water quality, Equations, Systems analysis, Ecology.
Identifiers: *Interdisciplinary analysis, Mass balance, Finite difference, Growth, Prediction.

Mathematical simulation of physical, chemical and biological processes of lakes exemplifies the interdisciplinary character of systems analysis. To develop a model capable of serving the broad objectives of planning for the management of, say, the Great Lakes, demands close interaction of many disciplines, including hydrology, meteorology, limnology, hydrodynamics, water chemistry, aquatic biology and ichthyology, as well as social and political scientists and water planners. As an example of interdisciplinary model building, Orlob considers the problem of designing a planning tool for evaluating the response of a lake's ecosystem. Such a tool, recently developed under auspices of the Department of Interior, serves to illustrate some problems of interdisciplinary communication. Discussed are ecologic concepts, including the ecosystem, primary production, algae-bacteria symbiosis, growth rate limitations, and growth rates of higher trophic levels. Other environmental factors considered are heat energy, toxicity, sedimentation, respiration, and light availability and attenuation. The model formulation, based on mass conservation, is described in terms of abiotic constituents and organic biomass. Finally, the initial model application results are considered. To conclude, a model of ecologic interactions, centered on water quality, can be adapted to a wide variety of aquatic systems, including stratified lakes. (See also W76-00060) (Bell-Cornell)
W76-00069

SIMULATION OF WATER-AND VAPOR-DOMINATED HYDROTHERMAL RESERVOIRS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W76-00087

WATER MANAGEMENT MODEL IN FLORIDA FROM ERTS-1 DATA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 7B.
W76-00096

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM OGEECHEE RIVER TO CARRABELLE RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00100

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 2. UPPER COLUMBIA RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00101

NUTRIENT INPUTS TO A LAKE AND THEIR EFFECTS UPON WATER QUALITY,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5C.
W76-00104

OIL POLLUTION STUDIES ON LAKE MARACAIBO, VENEZUELA,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 5A.
W76-00140

EXPERIMENTAL CRUDE OIL SPILLS ON A SMALL SUBARCTIC LAKE IN THE MACKENZIE VALLEY, N.W.T.: EFFECTS ON PHYTOPLANKTON, PERIPHYTON, AND ATTACHED AQUATIC VEGETATION,
Toronto Univ., (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-00142

HYDROLOGY OF THE SALT RIVER AND ITS RESERVOIRS, CENTRAL ARIZONA,
Arizona State Univ., Tempe.
J. N. Rinne.
Journal of the Arizona Academy of Science, Vol 10, No 2, p 75-86, June, 1975. 12 fig, 2 tab, 31 ref.

Descriptors: *Reservoir storage, *Ecology, *Water supply, *Semiarid lands, *Aquatic environment, Arizona, Hydrology, Floods, Drainage, Flood control, Rainfall, Precipitation(Atmospheric), Droughts, River basins, Water storage, Pumped storage, Dams, Lakes, Water shortage, Water allocation(Policy), Hydroelectric plants, Nutrients.
Identifiers: Salt River, Central Arizona.

The Salt River system of reservoirs is situated under hot-desert climatic regime and merits constant and continued monitoring of environmental conditions. Ever-increasing population densities in the metropolitan Phoenix area and requirements for water in a climate and area not characterized by such continually amplify the activities imposed upon these multiple-use impoundments. Hydrology, organic nutrient input and ecology of such desert reservoirs are largely dependent upon periodic flooding, and as a result, these aquatic systems may be ecologically unique. Extended drought periods combined with seasonal patterns of dam operation to supply domestic and irrigation water and hydro- electric power result in extreme changes in reservoir water levels and ecology. Recent structural modifications of dams on the Salt River system of reservoirs resulting in two pumped-storage units and increased generating capacities will further complicate the present hydrological scheme and future study of these aquatic environs. (Robinett-Arizona)
W76-00189

LABORATORY MODELING OF THERMAL STRUCTURE IN STAGNANT WATER,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
R. Viskanta, D. M. Snider, and M. Behnia.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 763. Purdue University Water Resources Research Center, Technical Report No 62, June, 1975. 70 p, 30 fig, 37 ref. OWRT A-029-IND (10).

Descriptors: *Thermal Stratification, *Water temperature, *Interferometry, Thermal radiation, Radiation, Heat, Temperature, Thermal properties, Heat budget, Water circulation, Physical properties, Thermal conductivity, Lakes, Rivers, Ponds, Cooling, *Diffusion, Model studies, *Pollutant identification, *Path of pollutants.
Identifiers: Mach-Zehnder interferometer.

Thermal stratification induced by solar radiation and cooling of thermally stratified and unstratified water from the surface was modeled in a laboratory to gain improved understanding of temperature structure in lakes, reservoirs, and ponds. Understanding of internal physical processes in stagnant waters is required in order to develop predictive models for complex hydraulic systems on a steady and unsteady basis. Experimentally, solar radiation was simulated by tungsten filament lamps in parabolic reflectors of known spectral radiation characteristics. The unsteady temperature distribution resulting from radiant heating of pure water in a glass-walled test cell was measured with a Mach-Zehnder interferometer. An analytical model appropriate for the laboratory arrangement was developed to predict the thermal stratification induced by radiation. Comparison between measured and predicted temperature profiles showed good agreement thus verifying the radiative and total energy transport models. Cooling of an initially uniform and thermally stratified layer of water was studied by observing the interference fringe patterns and by measuring interferometrically the temperature distribution. The buoyancy induced flow and temperature structure was quite complex. Detailed observations and discussions of results are given. A model was developed to predict the dynamics of the convective layer, and the predictions were in good agreement with the experimental data.
W76-00199

AIR PRESSURE OVER SURFACES EXPOSED TO WIND--II. RESERVOIRS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
A. R. Dedrick.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 3, p 508-513, May-June 1975. 3 fig, 6 tab, 9 ref.

Descriptors: *Wind pressure, *Reservoirs, Lake breezes, Design criteria, Winds, Laboratory tests, Pressure, Films, Membranes, Slopes.

Reservoirs lined with unprotected flexible membrane and film are subject to damage during high winds. The magnitude and location of wind forces were determined over reservoir models in a wind tunnel. Reservoir geometric characteristics studied included leeward and approach slope, approach-slope height, and breadth-to-depth ratio. The negative pressure area in relationship to the entire reservoir was minimum when the approach and leeward slopes and breadth-to-depth ratio were at the minimums studied, 1:4, 1:4, and 5, respectively. Under these conditions, the adverse pressure area was confined to the leeward slope and a small area near the top edge of the downwind slope, and the entire reservoir bottom was under positive pressure. In contrast, when the slope was steeper, flow separation zones probably were fully developed and covered larger parts of the reservoirs (entire reservoir when the breadth-to-depth ratio was 5), which resulted in nearly constant negative pressures over the interior surfaces of these systems. (See also W75-05179) (Jess-ISWS)
W76-00287

MICHIGAN DEMONSTRATION EROSION CONTROL PROGRAM,
Michigan Dept. of Natural Resources, Lansing. Water Development Services Div.
For primary bibliographic entry see Field 8B.
W76-00313

THE EFFECT OF THERMAL EFFLUENT UPON THE STANDING CROP OF AN EPIPHYTIC ALGAL COMMUNITY,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-00330

GEOCHEMICAL AND SEDIMENTOLOGICAL ANALYSIS OF TYGART LAKE, WEST VIRGINIA,
West Virginia Univ., Morgantown, Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-00376

EVALUATION OF A RECREATIONAL LAKE REHABILITATION PROJECT,
Dakota State Coll., Madison.
For primary bibliographic entry see Field 5A.
W76-00379

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EFFECT OF NUTRIENT INPUT REDUCTION ON THE EUTROPHICATION OF THE MADISON LAKES.
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5G.
W76-00500

2I. Water In Plants

INCLUSION OF PLANT MOISTURE STATUS IN COMBINATION-METHOD ESTIMATES OF PASTURE EVAPORATION,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 2D.
W76-00027

NET ASSIMILATION, WATER USE AND MICROCLIMATOLOGY OF A MAIZE CANOPY: IV. DIURNAL COURSES OF STOMATAL RESISTANCES AND WATER SATURATION DEFICIT OF LEAVES; EFFECTS UPON NET ASSIMILATION, (IN FRENCH),
Ceskoslovenska Akademie Ved, Prague. Ustav Experimentalni Botaniky.
J. Catsky, P. Chartier, and A. Djavanchir.
Ann Agron (Paris). Vol 24, No 3, p 287-305. 1973 Illus.

Descriptors: Soil-water-plant relationships, Plant growth regulators, *Plant growth, *Water requirements, Plant physiology, Diurnal, Microclimatology, Maize, Stomata, Leaves, Moisture deficit, Transpiration.

In the afternoon the stomatal resistances are higher than in the morning for the same irradiance and the same water saturation deficit of the leaves. The above results are discussed in terms of water diffusion in the soil plant atmosphere continuum and effects upon CO2 net exchange of leaves.--Copyright 1974, Biological Abstracts, Inc.
W76-00060

EVALUATION OF A THERMOCOUPLE HYGROMETER FOR MEASURING LEAF WATER POTENTIAL IN SITU,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
G. S. Campbell, and M. D. Campbell.
Agronomy Journal, Vol 66, No 1, p 24-27, January-February, 1974. 5 fig, 14 ref.

Descriptors: *Pressure measuring instruments, Pressure, Potatoes, Wheat, Vapor pressure, Leaves, Hygrometry, Evaluation, Measurement, Methodology.
Identifiers: Thermocouple hygrometer, *Leaf water potential, Pressure chamber.

Several methods for measuring leaf water potential in situ with thermocouple psychrometers or hygrometers have recently become available. Disadvantages of these methods include difficulty in construction or use, or excessive modification of the leaf environment. Comparisons between in situ and other measurements are generally lacking. An aluminum hygrometer which is relatively easy to build and use and covers only about 1.5 sq cm of leaf area is described. This hygrometer was tested in the laboratory and the field and readings were compared with those made with a pressure chamber for several plant species. The leaf hygrometer worked well in both field and laboratory situations. Comparisons between readings with the leaf hygrometer and a pressure chamber gave regression lines with slopes of 1, but the average pressure chamber reading was 0.4 to 1 bar lower than that obtained with the leaf hygrometer. The leaf hygrometer appeared to respond to plant water potential changes in less than 30 minutes. The equivalent error due to temperature gradients within the chamber was less than 0.4 bar. Measurement precision with this technique appears to be about 1 bar or better. (Skogerboe-Colorado State)
W76-00153

PINES ON A HIGH SALT DIET,
Soil Conservation Service, Cape May, N. J. Plant. Materials Center.
For primary bibliographic entry see Field 3C.
W76-00154

THE PARTIAL AREAS OF DISTRIBUTION OF EQUISETUM TELMATEIA EHRH. IN BELGIUM AND SOME NEW INTERESTING STANDS,
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Systematiek Morfologie.
W. Van Cotthem.
Nat Belg. Vol 54, No 4, p 162-169, 1973, Illus.

Descriptors: Europe, *Soil-water-plant relationships, Plant growth, Vegetation, *Distribution patterns, *Aquatic plants.
Identifiers: Belgium, Equisetum-telmateia, Great Horetail.

Certain plants with specialized ecologic preferences have a spread so scattered that their geographic distribution can be described as 'partial areas.' In Belgium this is true of the great horsetail, E. telmateia. This species has been found around Ypres, in mid-Belgium and in the valley of the Meuse. Some of these areas are described. Among relevant ecologic factors are slope, soil composition and water sources. Copyright (c) 1974, Biological Abstracts, Inc.
W76-00162

INFLUENCE OF PRECIPITATION ON PERENNIAL GRASS PRODUCTION IN THE SEMIDESERT SOUTHWEST,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-00195

MARINKA SCHIZOTHORAX INTERMEDIUS MCCLELLAND OF THE KATTAI WATER RESERVOIR (TADZHIKISTAN), (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dashanbe. Institut Zoologii i Parazitologii.
V. A. Maksunov.
Vopr Ikhtiol, Vol 13, No 3, p 562-565, 1973.

Descriptors: Fish, Reservoirs, Water temperature, Spawning, Fish reproduction, Summer, Seasonal.
Identifiers: Nemachilus-stoliczkai, *Schizothorax-intermedius, *USSR(Tadzhikistan).

Morphological and ecological study of Schizothorax intermedius in the Kattai Reservoir in Tadzhikistan, USSR is described. The water temperature reaches 19-20C during summer. Specimens caught reached weights of up to 600-1000 g. Spawning, starting in April-May at a water temperature of 15-17C, lasts until Aug. The nutritional coefficient is comparable to that determined for the same species in tributaries. With no fish farming, the population of S. intermedius, along with that of Nemachilus stoliczkai has been rising in the reservoir for years.--Copyright 1974, Biological Abstracts, Inc.
W76-00278

OXYGEN CONSUMPTION IN THE BROWN TROUT, SALMO TRUTTA M. FARIO L,
Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu.
M. Penaz, and M. Prokes.
Zool Listy., Vol 22, No 2, p 181-188. 1973.

Descriptors: *Brown trout, *Oxygen, Respiration, Temperature, Metabolism.

O2 consumption by respiration was investigated in brown trout, Salmo trutta m. fario, of various size and age (0+ to 3+) within a water temperature range of 10-20 C. The experiments were conducted under conditions of routine metabolism but were aimed at the needs of transportation of fish. Water temperature as well as individual weight affects the absolute and specific 02 consumption. Trout fry, o.1 g average body weight, consume 0.042 mg 02/h at 10 C, and 0.083 mg 02/h at 20 C. Old individuals weighing 100 g on the average consume 12.87 mg 02/hr at 10 C, and 28.20 mg 02/h at 20 C. Copyright 1974, Biological Abstracts, Inc.
W76-00283

WATER UPTAKE BY COTTON ROOT SYSTEMS: AN EXAMINATION OF ASSUMPTIONS IN THE SINGLE ROOT MODEL,
Agricultural Research Service, Ames, Iowa.
H. M. Taylor, and B. Klepper.
Soil Science, Vol 120, No 1, p 57-67, July 1975. fig, 3 tab, 20 ref.

Descriptors: *Soil-water-plant relationships, *Cotton, *Hydraulic conductivity, *Soil water movement, Consumptive use, Water utilization, Root systems, Groundwater potential, Soil water, Soil physical properties, Agriculture, Agronomy, Mathematical models, Laboratory tests, *Absorption.
Identifiers: *Water uptake(Cotton), Rooting density.

Several mathematical models have been developed to describe water uptake by plant root systems. These models usually incorporate one or more of the assumptions that water is proportional to rooting density, to soil hydraulic conductivity and to the water potential difference between the root surface and that in bulk soil midway between two adjacent roots. An experiment was conducted with cotton at the Auburn rhizotron to test the validity of these three assumptions. Soil water potential, soil hydraulic conductivity, water uptake, and rooting density were measured or estimated as functions of soil depth and time. Average plant water potential for a water extraction period was estimated from pressure chamber and continuous stem-diameter measurements. The assumption that water uptake is proportional to rooting density was valid. However, there appeared to be a large resistance in the pathway from root epidermis to root xylem. The other two assumptions must be modified to include this resistance. Therefore, water uptake was proportional to the water potential difference between root xylem and bulk soil and to the hydraulic conductivity of the combined soil-root pathway. There was no dependence-of-roots effect on the validity of these relationships. (Sims-ISWS)
W76-00306

A NEW MEASURE OF BIOTIC SIMILARITY BETWEEN SAMPLES AND ITS APPLICATION WITH A CLUSTER ANALYSIS PROGRAM,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Labs.
For primary bibliographic entry see Field 7B.
W76-00325

MORPHOLOGICAL CHARACTERISTICS OF THE CRUCIAN CARP OF THE KAIRAK-KUM RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
E. A. Fedorov.
Izv Akad Nauk Tadzh SSR Otd Biol Nauk., No 1, p 75-78. 1973. (Tadzh. summ.).

Descriptors: *Carp, Detritus, Reservoir, Fish stocking, Fish food organisms, Commercial fish, Fisheries.
Identifiers: *Carassius-Auratus-Gibelio, *Crucian Carps, Detritus, *USSR(Kairak-Kum Reservoir)

The crucian carp (Carassius auratus gibelio) was introduced in the Kairak-Kum Reservoir, USSR in the fall of 1959 to replenish the stock of economically valuable fishes and to utilize the food base, particularly the detritus, more fully. Under the new conditions the carp survived, reproduced and has become a commercial fish. The variations of meristic characters are similar to those of the crucian carp from other bodies of water. The morphological characters under the effect of the new environment changed easily, especially those pertaining to body parts performing important functions (Fins, pecto-ventral length and postorbital head length).--Copyright 1974, Biological Abstracts, Inc.
W76-00357

A STUDY OF THE MEXICAN DUCK (ANAS DIAZI) IN SOUTHEASTERN ARIZONA,
Arizona Game and Fish Dept., Phoenix.
G. P. O'Brien.
Special Report 5, June, 1975. 55 p, 18 fig, 13 tab, 24 ref.

Descriptors: *Aquatic life, *Drainage effects, *Habitat improvement, *Water supply, Maps, Ducks(Wild), *Mexican duck, Habitats, Wildlife habitats, Potholes, Wildlife conservation, *Arizona, Mexico, Drainage, Water holes, Drying, Water sources, Water utilization.
Identifiers: Southeastern Arizona, Habitat loss.

Due to its declining population in this country, the Mexican duck is currently listed as endangered by the U.S. Department of the Interior. The major cause attributed to the decline is loss of habitat, as a result of draining natural wetlands. Surveys made in Mexico in 1966 indicated that Mexican ducks were still present in small numbers, but scattered. Natural sinks and potholes were reported gone or rapidly drying due to livestock overgrazing, drainage for farming or becasue of water diversion for human usage. (Robinett-Arizona)
W76-00381

STAGES OF SALMO FARIO LINNE DEVELOPMENT IN THE CHAIKENDSK SALMON FACTORY (USSR), (IN RUSSIAN),
S. M. Vagirova, and Z. M. Kuliev.
Izv Akad Nauk Az SSR Ser Biol Nauk. No 3, p 75-80. 1972. (Azerb. summ.).

Descriptors: *Salmon, Breeding, Incubation, *Growth stages, Fish, Commercial fish, Trout, Fish hatcheries.
Identifiers: *Salmo-Fario, *USSR(Chaikendsk).

The incubating period at 4.6-5.0C is about 93 days. Young trout undergo 3 stages of development. The length of the stages of development in young trout is less than in young salmon. Commercial salmon are recommended as a prospect for breeding and growing.--Copyright 1974, Biological Abstracts, Inc.
W76-00468

2J. Erosion and Sedimentation

BAYOCEAN SPIT, OREGON: HISTORY OF DEVELOPMENT AND EROSIONAL DESTRUCTION,
Western Washington State Coll., Bellingham. Dept. of Geography.
For primary bibliographic entry see Field 2L.
W76-00004

QUANTITATIVE ESTIMATES OF BIOLOGICAL MIXING RATES IN ABYSSAL SEDIMENTS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-00010

POINT SOURCE DISPERSION IN TURBULENT OPEN CHANNELS,
Bogazici Univ., Istanbul (Turkey), Dept. of Mathematics.
For primary bibliographic entry see Field 8B.
W76-00014

SOIL DETACHMENT FROM CLODS BY SIMULATED RAIN AND HAIL,
Agricultural Research Service, Manhattan, Kans.
L. J. Hagen, L. Lyles, and J. D. Dickerson.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 3, p 540-543, May-June 1975. 2 fig, 6 tab, 18 ref.

Descriptors: *Hail, *Simulated rainfall, *Soil erosion, Mulching, Soils, Raindrops, Rainfall, Soil conservation, Agriculture, Agroclimatology, Wind velocity, Precipitation(Atmospheric).
Identifiers: *Hail size, *Clods, Terminal velocity, Kinetic energy, Soil detachment, Hail damage.

The effects of hail size and kinetic energy on soil detachment from clods during simulated rain under various windspeeds and amounts of surface mulch was examined. Amount of soil detachment depended on size and energy of hail, windspeed, and surface cover as well as on interactions among these variables. A hail energy of 0.53 cm-newtons per square cm increased soil detachment from clods more than 50%, and an energy of 5.3 cm-newtons per square cm more that doubled soil detachment as compared with no hail. Small hail caused some damage to clods but quickly covered the surface to form a protective cover against subsequent wind, rain, and hail damage. Thus, a hail diameter exceeding about 0.75 cm was necessary to increase soil detachment above the no-hail level. Both seeding clouds to reduce hail size, if successful, and maintaining a 50% or greater mulch cover could reduce soil detachment from clods during hailstorms. (Lee-ISWS)
W76-00030

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PARTS 9 AND 10. COLORADO RIVER BASIN AND THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00099

THE DEPOSITIONAL ENVIRONMENT OF ZINC, LEAD AND CADMIUM IN RESERVOIR SEDIMENTS,
Tulsa Univ., Okla. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W76-00292

PROCESSES AFFECTING THE CONCENTRATION OF SILICA AT THE SEDIMENT-WATER INTERFACE OF THE ATLANTIC OCEAN,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-00304

MICHIGAN DEMONSTRATION EROSION CONTROL PROGRAM,
Michigan Dept. of Natural Resources, Lansing. Water Development Services Div.
For primary bibliographic entry see Field 8B.
W76-00313

FORECASTING THE OCCURRENCE OF WIND EROSION OF SOIL, (IN RUSSIAN),
Volgograd Agricultural Inst. (USSR).
V. G. Nesterov, A. A. Vakulin, and K. S. Kal'yanov.
Dokl Vses Ord Lenina Akad S-Kh Nauk Im V I Lenina, No 7, p 5-6, 1973.

Descriptors: *Forecasting, *Wind erosion, *Soils, *Solar radiation, Tides, Oceans.

The dynamics of development of wind erosion of soils should be regarded as a consequence of the effect of long-period tidal-producing forces, solar activity, and interrelations of the ocean-continent system, which cause changes of atmospheric circulation and of the hydrothermal regime of the earth. The relation between wind erosion of soils and solar activity is considered, and a scheme is presented of the periodicity of development of wind erosion during the past 6000 yr, in which 4 phases of deflation corresponding to epochs of decreased precipitation effectiveness are distinguished. The phases of wind erosion are divided into periods and the periods into cycles. Primary attention in matters of combatting wind erosion should be concentrated on forecasting the phenomena and on the correct use of the fluctuations of hydrothermal regime, since the effectiveness of antideflation measures depends to a considerable extent on this.--Copyright (c) 1974, Biological Abstracts, Inc.
W76-00362

PHYSICAL AND SETTLING CHARACTERISTICS OF PARTICULATES IN STORM AND SANITARY WASTEWATERS,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-00372

GEOCHEMICAL AND SEDIMENTOLOGICAL ANALYSIS OF TYGART LAKE, WEST VIRGINIA,
West Virginia Univ., Morgantown, Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-00376

EVALUATION OF A RECREATIONAL LAKE REHABILITATION PROJECT,
Dakota State Coll., Madison.
For primary bibliographic entry see Field 5A.
W76-00379

2K. Chemical Processes

THE SOLUBILITY OF FERRIC OXYHYDROXIDES IN NATURAL WATERS,
Kansas State Univ., Manhattan. Dept. of Geology.
D. O. Whittemore, and D. Langmuir.
Ground Water, Vol 13, No 4, p 360-365, July-August 1975. 1 fig, 4 tab, 22 ref.

Descriptors: *Solubility, *Iron compounds, *Water properties, *Iron oxides, *Water chemistry, Physical properties, Chemical properties, Phase diagrams, Saturation, Oxidation-reduction potential, Chemical reactions, Geochemistry, Oxides, Hydrogen ion concentration, Chemical potential, Water.
Identifiers: *Ferric oxyhydroxides, *Natural waters, *Dissolved iron, *Ferric iron, *Ferrous iron, Magnetite, Siderite, Goethite, Hematite.

Iron in groundwater is often present both in solution and as suspended ferric oxyhydroxides. In most instances amounts of dissolved iron in natural waters are limited by the solubility of the ferric oxyhydroxides, whether suspended or present as part of aquifer materials. Oxyhydroxide solubilities, which range widely in natural waters, may be described by pQ = -log (Fe+++) (OH-)(OH-)(OH-), where (Fe+++) (OH-)(OH-)(OH-) is the product of ion activities in the water. pQ values calculated from Fe(II), Eh, and pH measurements in several types of high iron ground and surface waters (Fe(II) = 0.02 to 1460 ppm) indicate that most of the waters are in equilibrium with ferric oxyhydroxides which range from amorphus material to crystalline goethite (pQ values at 25C

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from about 37 to 44, respectively). Stabilities generally increase (higher pQ's) in a given water with time. In general, the lower the dissolved iron, the more soluble is the oxyhydroxide precipitated and the slower its increase in stability. This was observed both in coastal-plain groundwaters (pQ = 36.6 - 42.7), and in laboratory aged solutions. The faster the oxidation and hydrolysis rate of dissolved Fe(II), the lower the pQ, as shown by the reaction of mineralized spring waters with varying amounts of surface waters (pQ = 37.2 - 41.5). (Henley-ISWS)
W76-00011

GROUND-WATER QUALITY IN THE SHIRAZ BASIN, SOUTH IRAN,
Tehran Univ., (Iran). School of Engineering.
S. Nejand, and R. A. Khan.
Ground Water, Vol 13, No 3, p 269-274, May-June 1975. 7 fig, 2 tab, 15 ref.

Descriptors: *Groundwater, *Groundwater basins, Water types, *Water quality, *Diagenesis, Percolating water, Freshwater, Alluvial aquifers, Aquifers, Potentiometric level, Geochemistry, Water properties, Hydrogeology, Chemical reactions, Chemical analysis, Water sources, Anions, Chlorides, Bicarbonates, Sulfates.
Identifiers: *Iran(Shiraz Basin), Triangular plots.

Groundwater of Shiraz alluvial basin in Zagros range (south Iran) showed three principal anion types, namely chloride, sulfate, and bicarbonate. Intermediate types between these groups were also present, which seem to represent modifications in groundwater due to diagenesis. Possible chemical origin of the groundwater is mainly due to two major processes either acting individually or collectively, i.e., solution of minerals of the geological formation and mixing of groundwater accompanied by the precipitation of some constituents such as calcium. (Prickett-ISWS)
W76-00012

NITRATE DETERMINATION WITH INDIGO CARMINE,
Water Management Board, Brno (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W76-00021

CHEMICAL QUALITY OF WATER IN CONSERVATION AREA 2A AND ASSOCIATED CANALS,
Cental and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
For primary bibliographic entry see Field 5A.
W76-00033

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1972-73 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-00086

THE DETERMINATION OF SPECIFIC FORMS OF ALUMINUM IN NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-00091

GEOLOGIC MAP SHOWING SPRINGS RICH IN CARBON DIOXIDE OR CHLORIDE IN CALIFORNIA,
Geological Survey, Menol Park, Calif.
For primary bibliographic entry see Field 7C.
W76-00092

WATER RESOURCES OF GOVE, LOGAN, AND WALLACE COUNTIES, WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W76-00093

WATER RESOURCES OF WISCONSIN-UPPER WISCONSIN RIVER BASIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 7C.
W76-00094

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PARTS 9 AND 10. COLORADO RIVER BASIN AND THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00099

APPLICATION OF GAS CHROMATOGRAPHY OF VOLATILE METAL CHELATES TO WATER ANALYSIS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5A.
W76-00105

TOXIC HEAVY METALS IN GROUNDWATER OF A PORTION OF THE FRONT RANGE MINERAL BELT,
Colorado School of Mines, Golden. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-00274

MOVEMENT OF TRACE METALS WITH PERCOLATING WATER,
Rhode Island Univ., Kingston. Dept. of Civil Engineering; and Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W76-00374

GROUND WATER GEOCHEMISTRY OF THE PAHASAPA LIMESTONE,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.
P. H. Rahn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 103, $3.75 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 29 p, 9 fig, 4 tab, 15 ref. OWRT A-046-SDAK (1). 14-31-0001-4042.

Descriptors: *Geochemistry, Radioisotopes, *Radioactive dating, Age, Groundwater, Water quality, *South Dakota, *Wyoming, *Water wells, *Springs, Dissolved solids, Carbon dioxide, Calcite, *Groundwater movement, Pollutant identification.
Identifiers: Pahasapa Limestone(SD-WYO), Black Hills(SD-WYO).

Springs and wells penetrating the Pahasapa (Madison) LIMESTONE AND Minnelusa Formation near the Black Hills, South Dakota and Wyoming, were analyzed for chemical constituents. The total dissolved solids (TDS) ranged from a high of 2,280 ppm at Cascade Spring to a low of 150 ppm at springs along Ditch Creek. Discharge rates and TDS data indicate that the combined chemical weathering for the Paliozoic aquifer results in a reduction of the landscape of at least 0.55 inches per 1,000 years. Radiocarbon isotope age dating of selected well waters penetrating the Pahasapa Limestone in adjoining basins shows that there is a slow deep ground water movement out away from the Black Hills. The oldest water encountered was at the Midland, South Dakota well where 22,800 year old wa was found. The deposition of calcareous t below some springs seems to be due to the loss pressure on deeply circulation waters, and summer warming of the spring waters. Both pressure loss and temperature rise leads to lowering in the solubility of carbon dioxi which, when released, causes calcite precipitate. (Wiersma-South Dakota State)
W76-00375

2L. Estuaries

BAYOCEAN SPIT, OREGON: HISTORY DEVELOPMENT AND EROSIONAL DESTRU TION,
Western Washington State Coll., Bellingha Dept. of Geography.
T. A. Terich, and P. D. Komar.
Shore and Beach, Vol 42, No 2, p 3-10, Octo 1974. 10 fig, 4 ref. NOAA 04-5-158-2.

Descriptors: *Beach erosion, *Waves(Wat *Erosion, *Jetties, *Tides, *Storms, *Oregon, toral drift, Shores, Oceans, Dikes, Sand bars.
Identifiers: *Bayocean Spit(Ore).

The history of Bayocean Spit in Oregon traced starting from its early development int thriving tourist, vacation, and retirement com nity to its ultimate destruction by waves, tid erosion and some mismanagement. The histor overview dated back to 1907 and traced up to 19 The affects of railroad and ordinary road devel ment, the 1929 depression, and world war II w depicted and analyzed in detail. It was pointed that the construction and lengthening of a je near the north end of the spit accelerated the e sion of the spit in its narrow neck, and a comb tion of high tides and storm waves ultima broke the neck. Subsequent tides deepened widened the breach. When a jetty is construc the longshore current deposits sands in and aro the jetty and must erode at some other place pick up the sand which the longshore curren capable of transporting. Erosion will take pl after the construction of a jetty even in ar where there is no nets and drift. Sand will ten accumulate close to the jetty with erosion greater distances from the jetty which was principal cause of the erosion of the neck Bayocean Spit. (Bhowmik-ISWS)
W76-00004

QUANTITATIVE ESTIMATES OF BIOLO CAL MIXING RATES IN ABYSSAL SE MENTS,
Texas A and M Univ., College Station. Dept Oceanography.
N. L. Guinasso, Jr., and D. R. Schink.
Journal of Geophysical Research, Vol 80, No 2 3032-3043, July 20, 1975. 3 fig, 4 tab, 31 ref, pend. ONR N-00014-68-A-0308-0002.

Descriptors: *Sediments, *Mixing, *Ocea Benthos, Benthic fauna, Model studies, Mat matical models, Sampling, Bottom sampl Cores, Oceanography.
Identifiers: *Abyssal sediments, Biological m ing.

Biological mixing in deep-sea sediments described in terms of a time-dependent eddy di sion model, with mixing taking place at depth constant eddy diffusivity D. The differential eq tion describing the model was solved for an pulse source of tracer delivered to the plan surf at the top of the mixed layer. The solution served as a Green's function, and was usec determine the distribution of tracer in depth time for a surface input of tracer. The cha teristic properties of the solution are dependen the dimensionless parameter D/Lv, where v is sedimentation rate. If D/Lv is greater than 10, surface layer becomes homogeneous. If D/L

less than 0.1, mixing can take place before the sediments are buried, and the surface concentration propagates downward into the sediments with little dispersion. For all values of D/Lv, the weighted mean depth of the concentration distribution is the depth at which an impulse source would be found in the sediment if no mixing had taken place. Microtektite data indicate that abyssal sediments are mixed from the surface to a maximum mixing depth between 17 and 340 cm below the surface. Mixing occurs at rates between 1 and 100 sq cm/1000 years. Higher mixing rates may occur nearer the surface, but microtektite distributions cannot be used to estimate these rates in the presence of the deeper, slower mixing. Estimates for D based on dimensional analysis of sediment reworking rates for nearshore organisms were used to predict abyssal mixing rates by invoking the assumption that mixing is proportional to biomass. (Sims-ISWS)
W76-00010

LOOP-RATING CURVES FOR VARIOUS UNSTEADY FLOWS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-00088

A STUDY OF THE EFFECTS OF THE SAN FRANCISCO OIL SPILL ON MARINE LIFE, PART II: RECRUITMENT,
College of Marin, Kentfield, Calif.
For primary bibliographic entry see Field 5C.
W76-00135

PETROLEUM HYDROCARBONS AND OYSTER RESOURCES OF GALVESTON BAY, TEXAS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W76-00143

FATE AND EFFECTS OF CRUDE OIL ON AN ESTUARINE POND,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 5C.
W76-00148

SEWAGE TREATMENT AND DISCHARGE INTO TROPICAL COASTAL WATERS,
University of the South Pacific, Suva (Fiji). School of Natural Resources.
For primary bibliographic entry see Field 5E.
W76-00259

THE OCCURRENCE AND DEVELOPMENT OF GUEST SINK, HERNANDO COUNTY, FLORIDA,
Southwest Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 4B.
W76-00296

PROCESSES AFFECTING THE CONCENTRATION OF SILICA AT THE SEDIMENT-WATER INTERFACE OF THE ATLANTIC OCEAN,
Texas A and M Univ., College Station. Dept. of Oceanography.
D. R. Schink, N. L. Guinasso, Jr., and K. A. Fanning.
Journal of Geophysical Research, Vol 80, No 21, p 3013-3031, July 20, 1975. 12 fig, 6 tab, 81 ref. ONR N-00014-68-A-0308-0002, N-00014-68-A-0215, NSF GA41200.

Descriptors: *Silica, *Atlantic Ocean, *Sediment-water interfaces, *Sea water, Oceanography, Oceans, Interfaces, Chemistry, Chemical properties, Sediments, Bottom sediments, Biochemistry, Model studies, Mathematical models, On-site investigations, Connate water, Cores, Sampling.
Identifiers: Ocean floor.

A model for interstitial silica concentrations was derived, incorporating biological mixing of sediments. This model predicted concentrations and gradients and could account for the observed geographical variations in interstitial silica on the basis of a dynamic balance between solution of silica particles and diffusion from the sediments. The flux of particulate biogenous silica into the sediments was confirmed as an important parameter controlling interstitial silica concentrations. Biological mixing of sea floor sediments also has an important influence on interstitial composition by modifying the depth at which dissolving particles react. Faster mixing raises the interstitial concentration. The rate at which siliceous particles dissolve also plays a role; the slower they dissolve, the greater the interstitial silica concentration. Measurements on near-bottom water of the Atlantic showed no consistent gradients in dissolved silica, but Antarctic bottom water seemed significantly more variable in the benthic boundary layer than in the water mass above or in the benthic zone of North Atlantic deep water. (Sims-ISWS)
W76-00304

SIMPLE METHOD FOR MEASURING RELATIVE HUMIDITY, WATER AND AIR TEMPERATURES WITHIN A FEW MILLIMETERS OF WIND-GENERATED WATER WAVES,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 7B.
W76-00310

AN ESTUARINE LOW-TEMPERATURE FISH-KILL IN MISSISSIPPI, WITH REMARKS ON RESTRICTED NECROPSIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 5C.
W76-00321

'MIGRATION' OF BLOWOUTS IN SEAGRASS BEDS AT BARBADOS AND CARRIACOU, WEST INDIES, AND ITS ECOLOGICAL AND GEOLOGICAL IMPLICATIONS,
Bellairs Research Inst., St. James (Barbados).
For primary bibliographic entry see Field 5C.
W76-00329

EFFECTS OF INGESTED MIREX AND DDT ON JUVENILE CALLINECTES SAPIDUS RATHBUN,
Florida Univ., Gainsville. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-00333

ON OCCURRENCE OF SIMILAR ORGANISMS TO GYMNODINIUM BREVE DAVIS IN OMURA BAY, (IN JAPANESE),
Nagasaki Univ., (Japan) Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W76-00341

SKIMMING OF FRESH WATER AFLOAT UPON SALT WATER,
Pant Univ. of Agriculture and Technology, Pantnagar, Govind Ballabh (India).
For primary bibliographic entry see Field 4B.
W76-00405

USE OF A BIOASSAY TEST IN EVALUATING THE TOXICITY OF DRILLING FLUID ADDITIVES ON GALVESTON BAY SHRIMP,
Milchem Inc., Houston, Tex.
For primary bibliographic entry see Field 5A.
W76-00408

ENVIRONMENTAL EFFECTS OF DRILLING MUDS AND CUTTINGS,
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field 5C.
W76-00411

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE H. K. FERGUSON COMPANY CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Ferguson (H.K.) Co., Cleveland, Ohio.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 875, $7.00 in paper copy, $2.25 in microfiche. Special Report No 08, August 1965, 193 p, 3 fig, 6 tab, 11 ref. OSW 14-01-0001-517.

Descriptors: *Deslination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria.
Identifiers: *Process design, *Multiple-effect multiple-flash system.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. The process described in this study employs a multiple-effect, multi-flash system consisting of twenty-one effects of flash evaporation, five stages per effect. To provide a high degree of reliability the plant has been designed as two identical parallel trains of 25 MGD each, thus, a failure of any major component will result in a minimum loss of plant capacity until the failed equipment can be reparied or replaced. Performance ratio is 20.4 lbs. water/lb. steam with a total water cost of $0.47 per thousand gallons. (See also W76-00159 thru W76-00173) (OWRT)
W76-00158

THE FLUOR CORPORATION LTD. CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Fluor Corp. Ltd., Los Angeles, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 876, $4.75 in paper copy, $2.25 in microfiche. Special Report No 09, August 1965, 66 p, 4 fig, 11 tab, 1 ref. 14-01-0001-535.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design critera.
Identifiers: *Process design.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. The plant described employs the conventional multistage flash process. Four parallel evaporator trains were selected to best satisfy conditions of the study. Trains are arranged symmetrically with heat rejection sections centralized about

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a common pump pit to minimize costly piping runs between the various elements. All evaporator vessels are of concrete construction prestressed by post tensioning both longitudinally and circumferentially. Tubes of 90-10 CuNi, performance ratio is 13.6 lbs. water/lb. steam, water cost is $0.421 per thousand gallons. (See also W76-00158 thru W76-00173) (OWRT)
W76-00159

THE BADGER COMPANY CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Badger Co., Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 877, $7.50 in paper copy, $2.25 in microfiche. Special Report No 10, August 1964, 202 p, 9 fig, 19 tab, 8 ref. OSW 14-01-0001-515.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria.
Identifiers: *Process design.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. The Badger study considers the Multi-Stage Flash (MSF) process, achieving a minimum overall pressure drop by an uninterrupted flow path of brine and product water through the evaporator flashing area. A performance ratio of 20 pounds of product water per pound of steam yields a calculated water cost of $0.323 per thousand gallons. The specified 30-year write-off at low interest rates allows comparatively high capital expenditures favoring titanium tubing for brine service which contributes to low maintenance and operating costs. (See also W76-00158 thru W76-00173) (OWRT)
W76-00160

THE DOW CHEMICAL COMPANY CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Dow Chemical Co., Midland, Mich.
Available from the National Technical Information Service, Springfield, Va 22161, as PB 245-886, $11.25 in paper copy, $2.25 in microfiche. Special Report No 11, 1965, 336 p, 37 fig. OSW 14-01-0001-519.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics Evaluation, Costs, *Design criteria.
Identifiers: *Process design, *Multiple-effect falling-film process.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. The system selected by Dow for this study is based on the multiple-effect, falling-film process. Twenty effects are used yielding a gain ratio of 14.9 and a water cost of $0.427 per thousand gallons. Seawater pretreatment yields a feed with no alkalinity, no oxygen, no dissolved gases. An ion exchange pretreatment allows the feedwaters to be heated to more than 325degree F.Included as a part of this study is a computer program for a Multiple Effect LTV Evaporation process by Houston Research Institute. (See also W76-00158 thru W76-00173.) (OWRT)
W76-00161

C. F. BRAUN AND COMPANY CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Braun (C. F.) and Co., Alhambra, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as PB 245-878, $7.25 in paper copy, $2.25 in microfichecopy. Special Report No 13, August 1965, 198 p. 30 fig, 2 tab, 28 ref. OSW 14-01-0001-527.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria, *Long-tube vertical distillation.
Identifiers: Process design.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical Californi coastal site with capital and operating costs based on December, 1964, values. The most efficient scheme is claimed to be a combination of the long tube vertical (LTV) multiple effect evaporation and the multistage flash concept. The major portion of the process heat load is transferred at constant temperature differential in the falling film evaporator, the most thermally efficient part of the process. Thermodynamic improvement over the conventional LTV process is realized by utilizing MSF stages for heating the seawater. A unique design for the multiple effect evaporator stages consists of a series of annular contiguous effects with common walls. Cost of product water is $0.313 per thousand gallons. (See also W76-00158 thru W76-00173.) (OWRT)
W76-00163

BURNS AND ROE, INC. CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Burns and Roe, Inc., New York.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-179 393, $5.75 in paper copy, $2.25 in microfiche copy. Special Report No 14, October 1965. 103 p, 14 fig, 10 tab. OSW 14-01-0001-526.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria.
Identifiers: *Process design, *Flashing brine heat energy.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to [illegible] located on a typical California coastal site w[illegible] capital and operating costs based on Decemb[illegible] 1964, values. This study looks at the multiple st[illegible] flash (MSF) system noting that the bulk of [illegible] costs is in the flashing brine heat recovery syst[illegible] and that many conventional components pres[illegible] little, if any chance for improvement. Two c[illegible] cepts are considered both employing 28 stag[illegible] The first scheme is a conventional layout requir[illegible] a relatively large area with modules either in l[illegible] or in parallel, the second is designed for ar[illegible] where land is scarce and would stack success[illegible] stages in a vertical array thus requiring a m[illegible] smaller plot size. A number of innovative mat[illegible] als concept are outlined. Water costs range fr[illegible] $0.34 to 0.40 per thousand gallons. (See also W[illegible] 00158 thru W76-00173) (OWRT)
W76-00164

GENERAL ELECTRIC COMPANY CONC[illegible] TUAL DESIGN OF A 50 MGD DESALINATI[illegible] PLANT.
General Electric Co., Burlington, Vt.
Available from the National Technical Infor[illegible] tion Service, Springfield, Va 22161, as PB-178 9[illegible] $6.25 in paper copy, $2.25 in microfiche. Spe[illegible] Report No 15, November 1965, 158p, 39 fig. 1[illegible] OSW 14-01-0001-538.

Descriptors: *Desalination, Distillation, *Fl[illegible] distillation, Sea water, *Heat transfer, Design, [illegible] strumentation, *Evaporation, *Condensat[illegible] Economics, Evaluation, Costs, *Design crite[illegible] Thin films.
Identifiers: *Process design, *Thin film distilla[illegible] process.

The objective of this study is to produce a de[illegible] which advances the technology of seawater c[illegible] version and to present the results in a form wh[illegible] can be used by any qualified individual or firm[illegible] the basis for an architectural-engineering des[illegible] Ground rules furnished by OSW specified [illegible] only the desalination section of a dual-purp[illegible] power-water plant be considered and that it[illegible] designed for a 30-year life. Process and struct[illegible] design ideas are to be presented in terms of[illegible] complete plant concept. The complex is to[illegible] located on a typical California coastal site [illegible] capital and operating costs based on Decem[illegible] 1964, values. This study concerns the applica[illegible] of the General Electric thin film distilla[illegible] process to the above outlined objective. An[illegible] creased rate of heat transfer is achieved by gen[illegible] tion of thin films on both sides of the vertic[illegible] oriented double-fluted tubes with steam [illegible] densing on the outside and a falling film of [illegible] evaporating off the inside. Computations s[illegible] that a plant of 22 effects coul produce water [illegible] cost of $0.314 per thousand gallons at a [illegible] formance ratio of 17 lbs. water/lb. steam. (See [illegible] W76-00158 thru W76-00173.) (OWRT)
W76-00165

LOCKHEED MISSILES AND SPACE COMP[illegible] CONCEPTUAL DESIGN OF A 50 M[illegible] DESALINATION PLANT.
Lockheed Missiles and Space Co., Sunn[illegible] Calif.
Available from the National Technical Info[illegible] tion Service, Springfield, Va 22161, as PB-245[illegible] $8.50 in paper copy, $2.25 in microfiche.Sp[illegible] Report No 16, 1965, 262 p, 32 fig, 22 tab, 52[illegible] OSW 14-01-0001-539.

Descriptors: *Desalination, Distillation, *[illegible] distillation, Sea water, *Heat transfer, Desig[illegible] strumentation, *Evaporation, *Condensa[illegible] Economics, Evaluation, Costs, *Design cri[illegible] Condensers.
Identifiers: *Process Design, Condenser tube [illegible] dle design.

The objective of this study is to produce a d[illegible] which advances the technology of seawater

version and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. This study embodies a multi-flash system incorporating advanced design concepts. Plant is divided into four equal evaporator modules(12.5 MGD each) each consisting of 3 heat rejection and 27 heat recovery stages. Each module, a complete plant in itself, can be operated and controlled independently allowing planned outstages for maintenance without shutting down the complete system. Innovations include a condenser tube bundle design which eliminates water boxes and expansion bellows and the use of a dropwise promoter to achieve a practically attainable dropwise condensation system. Water cost is $0.43 per thousand gallons. (See also W76-00158 thru W76-00173) (OWRT)
W76-00166

BALDWIN-LIMA-HAMILTON CORP. CONDEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Baldwin-Lima-Hamilton Corp., Philadelphia, Oa.
Available from National Technical Information Service, Springfield, Va 22161, as PB-245 880, $5.25 in paper copy, $2.25 microfiche. Special Report No 17, April 1966, 36 p, 15 fig, 19 tab, 33 ref. OSW 14-01-0001-513.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria.
Identifiers: *Process Design, *Combined multiple extraction system.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. The BLH design is based on the concept of a combined Multiple Extraction (COMEX) system, yielding a performance ratio of 18 and consisting of a multi-effect, multi-stage (MEMS) process having a top temperature of 255F combined with a once-through system having a top temperature of 290F. Cost of product water is $0.368per thousand gallons. (See also W76-00158 thru W76-00173) (OWRT)
W76-00167

AQUA-CHEM, INCORPORATED CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Aqua-Chem, Inc., Waukesha, Wis.
Available from National Technical Information Service, Springfield, Va 22161, as PB-245 881, $5.75 in paper copy, $2.25 in microfiche. Special Report No 18, December 1965, 120 p, 12 fig. OSW 14-01-0001-514.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea wate, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria, Brines.
Identifiers: *Process design, *Single-effect multiple-stage cycle.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. Aqua Chem views the optimum plant as featuring a brine temperature of 245 F using the simple and extensively field proven single-effect, multi-stage flash cycle employing brine recirculation. The lower cost of vessels attributable to low operating pressures plus the use of titanium tubing indicate an optimized longer life and lower operating cost. Concrete is considered as an alternate construction material provided certain precautions are observed. Total product water cost is $0.291 per thousand gallons. (See also W76-00158 thru W76-00173) (OWRT)
W76-00168

FOSTER WHEELER CORPORATION CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Foster Wheeler Corp., Livingston, N. J.
Available from National Technical Information Service, Springfield, Va 22161, as PB-245 882, $5.75 in paper copy, $2.25 in microfiche. Special Report No 19, September 1965, 118 p, 12 fig. OSW 14-01-0001-518.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria.
Identifiers: *Process design, Heat rejection, Heat recovery.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be desinged for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. The plant described is of the conventional single effect, multiple stage type employing four stages of heat rejection and 68 stages of heat recovery. Plant is modular in concept, permitting shop fabrication of 100 foot long modules containing factory tubed condenser bundles and employing internal water boxes for field welding of successive 100 foot sections. An iron modified 70-30 CuNi alloy has been selected as an optimum material for 30 year life. Total cost of product water is calculated at $0.35 per thousand gallons based on a performance ratio of 15. (See also W76-00158 thru W76-00173) (OWRT)
W76-00169

WORTHINGTON CORPORATION CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Worthington Corp., Harrison, N.J.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 884, $9.50 in paper copy, $2.25 in microfiche. Special Report No 20, August 1965, 304 p, 34 fig, 37 ref. OSW 14-01-0001-529.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria.
Identifiers: *Process design, Heat rejection, Heat recovery.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. The Worthington study covers the optimization of a multi-stage flash process designed with four parallel flow streams each employing 59 heat recovery stages and 2 heat rejection stages with a maximum brine temperature of 270F and a gain ratio of 19.76 pounds of water per pound of steam. Total water cost is $0.361 per thousand gallons. Vessels are of steel (ASTM A-285), tubes in the heat rejection section are 9-10 Cuni while those in the heat recovery sections are of aluminum brass. Tube sheets are 90-10 Cuni throughout. (See also W76-00158 thru W76-00173) (OWRT)
W76-00170

THE ALLIS-CHALMERS MANUFACTURING COMPANY CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Allis-Chalmers Mfg. Co., Milwaukee, Wis., Greendale Labs.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 883, $6.25 in paper copy, $2.25 in microfiche. Special Report No 21, July 1965, 138 p, 59 fig, 25 ref. OSW 14-01-0001-525.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria.
Identifiers: *Process design, *Cross flow evaporation.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. This study considers the single-effect multi-cross flow evaporation process (SEMS) to be most promising. The process has already been proven in a demonstration size plant and presently appears to be the simplest and least expensive when considered in conjunction with dual-purpose operation. The plant also lends itself to modular type construction which is considered a cost advantage. Aluminum brass and 90-10 CuNi have been chosen as tubing materials for the heat recovery and heat rejection stages respectively. Predicted water costs are $0.354 per thousand gallons. (See also W76-00158 thru W76-00173) (OWRT)
W76-00171

APPLIED RESEARCH AND ENGINEERING, LTD. CONCEPTUAL DESIGN OF A 50 MGD DESALINATION PLANT.
Applied Research and Engineering Ltd., Durham (England).
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 885, $5.75 in paper copy, $2.25 in microfiche. Special

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Report No 22, 1965, 131 p, 34 fig. OSW 14-01-0001-528.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria, Recirculated water.
Identifiers: *Process design.

The objective of this study is to produce a design which advances the technology of seawater conversion and to present the results in a form which can be used by any qualified individual or firm as the basis for an architectural-engineering design. Ground rules furnished by OSW specified that only the desalination section of a dual-purpose power-water plant be considered and that it be designed for a 30-year life. Process and structural design ideas are to be presented in terms of the complete plant concept. The complex is to be located on a typical California coastal site with capital and operating costs based on December, 1964, values. This study favors recirculation in preference to a once-through process. Parameters chosen indicate optimum design to be 69 stages in the heat recovery section and 4 in the heat rejection section. The design considers individual aspects of plant components including tube bundle size and geometry, acid dosing and degassing. Recommended further areas of study would increase heat transfer coefficients via better venting techniques, thin walled tubing, and longer tubes. Possible use of concrete as main vessel structure is suggested. Also use of standby service pumps for all circuits to reduce outage time is suggested. (See also W76-00158 thru W76-00173) (OWRT)
W76-00172

C. F. BRAUN AND COMPANY CONCEPTUAL DESIGN 150-MGD LTV DESALTING PLANT.
Braun (C.F.) and Co., Alhambra, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 889, $6.25 in paper copy, $2.25 in microfiche. Special Report No 23, August 1966, 97 p, 12 fig, 12 ref. OSW 14-01-0001-733.

Descriptors: *Desalination, Distillation, *Flash distillation, Sea water, *Heat transfer, Design, Instrumentation, *Evaporation, *Condensation, Economics, Evaluation, Costs, *Design criteria, *Long-tube vertical distillation.
Identifiers: *Process design.

A direct comparison is made of the MSF desalting plant designed by Bechtel and the LTV-MSF plant designed by Braun for the Metropolitan Water Department of Los Angeles. The desalting plant is assumed to be located adjacent to the nuclear power plant which supplies steam and power for operation. Identical process parameters were used for both plants; the assumption of identical steam consumption eliminated power plant economics from the comparison. Lower product water costs are claimed for the LTV-MSF process in the areas of both capital cost and operating cost. A claimed thermo-dynamic advantage for the LTV-MSF results in lower total installed heat transfer surface; on the operating side the once-through LTV-MSF process, pumping less sea water by virtue of brine concentration 50% greater than MSF, allows smaller seawater pumps (hence lower pumping cost) and lower acid consumption. (See also W76-00158 thru W76-00173) (OWRT)
W76-00173

MEMBRANE PROCESSES FOR WATER TREATMENT, CONCLUSION,
Aberdeen Univ., (Scotland). Dept. of Chemistry.
J. B. Craig, C. R. Gardner, and P. Meares.
Effluent and Water Treatment Journal, Vol 15, No 7, p 345, 353-356, July, 1975. 2 fig, 45 ref.

Descriptors: *Water treatment, *Desalination, *Membrane processes, *Reverse osmosis, Desalination processes, Separation techniques, Membranes, Semipermeable membranes, *Waste water treatment.
Identifiers: *Piezodialysis, Charge-mosaic membranes.

The four basic designs of reverse osmosis modules are the plate-and-frame, tubular, spiral-wound, and hollow-fiber types. The main applications of reverse osmosis are in the field of desalination and in the treatment of waste and rinse waters. RO will remove non-ionic and organic as well as ionic pollutants. RO is also used as a concentrating and fractionating technique in the food and pharmaceutical industries. It is an attractive alternative to other separation and concentration processes because of its simplicity, versatility, broad applicability, and low energy requirements. The costs per unit produced generally decrease as the size of the plant increases. Overall operating costs are largely affected by the cost and frequency of membrane replacement. A recently introduced membrane process is piezodialysis. Differences between this process and RO are that this process uses charge-mosaic membranes and that the permeate under pressure is a liquid stream far more concentrated than the feed which becomes less concentrated and forms the product in a desalination process. A charge-mosaic membrane contains a parallel alternating array of cation and anion-exchanging resins each of which extends throughout the active thickness of the membrane. Piezodialysis offers the following advantages: small defects in the membrane may cause only a slight decrease in the efficiency of the process and not serious contamination of the product water as would occur in reverse osmosis; uncharged contaminants are likely to remain in the product water from piezodialysis; and, the concentration of salt in the product water can be varied by changing the length of the desalination chamber. (Orr-FIRL)
W76-00241

EVALUATION OF A 35-GPH PORTABLE DESALINATION PLANT AND CONCEPTUAL DESIGN OF A 220-GPH CONTAINERIZED PLANT,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
J. C. King.
Available from the National Technical Information Service, Springfield, Va 22161, as AD A-004 928, $3.25 in paper copy, $2.25 in microfiche. Naval Facilities Engineering Command, Alexandria, Va, Report No TN-1370, January, 1975. 22 p, 8 fig, 2 append.

Descriptors: *Desalination apparatus, *Desalination plants, *Waste water treatment, *Potable water, Water supply, Sea water, Fresh water.
Identifiers: Mobile water desalination plant.

The performance of a mobile water desalination plant to be used for Navy bases was tested. The Model D-20 Watermaker plant is suitable for temporary use as a portable, self-contained unit to supply water immediately after field forces establish a beachhead. The plant was operated for over 2000 hours. The unit has a low product-to-fuel ratio (10-to-1) and operates with an oil-fired boiler as its heat source. Raw seawater is distilled in a vacuum of about 25 inches mercury, which lowers the boiling point of water to between 115F and 130F, operating temperatures low enough to minimize scale formation. Raw water is distributed through four circuits to: provide a source of raw water for evaporation into distilled vapor; cool the upper heat exchanger which condenses the distilled vapor to fresh water; give power to the jet pump which creates a vacuum in the distillation chamber; and, provide power for the jet pump to discharge brine from the distillation chamber. A conceptual design has been prepared for a 220-gph plant that can be fully self-contained in a standard 8 X 8 X 20 foot container. (Kramer-FIRL)
W76-00245

3B. Water Yield Improvement

PRODUCTION OF ICE CRYSTALS BY RIMI IN SLIGHTLY SUPERCOOLED CUMULUS,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B
W76-00019

WATER FOR WYOMING'S COAL,
Geological Survey, Denver, Colo.
H. H. Hudson.

Descriptors: *Water supply, *Water utilizati *Imported water, *Coal mines, *Wyoming, S mines, Mining, Planning, Water requireme Costs, Pipelines, Energy, Coals.
Identifiers: Northeast Wyoming.

In terms of coal, northeastern Wyoming is roug 20,000 square miles extending into six coun stretching from the Big Horn Mountains on west to the Black Hills on the east and nearly far south as Casper. The bulk of the region's m strippable coal deposits are contained wi Campbell County. In fact, Campbell Count reputed to have more coal than any other count the United States. The proposals to import w into northeaster Wyoming involve diversions f the Yellowstone River system. One propo system would transport water from Boysen Re voir on the Big Horn River to Gillette via a mile-long pipeline. The system would del 135,000 acre-feet per year at an estimated $250 acre-foot. This and the following dollar estim are based on 1974 costs. Further downstream the Yellowstone River proper, a diversion is u consideration that would require a 180- pipeline from Hardin, Mont., to Gillette. delivery price per acre-foot at Gillette would about $220, and the system would provide 312 acre-feet annually to northeastern Wyoming. E further downstream on the Yellowstone is ano possible diversion site at Miles City, Mont. A mile aqueduct would be required to deliver w to the Gillette vicinity. The acre-foot cost of w near Gillette would be about $220 for 382,000 a feet per year. (Woodard-USGS)
W76-00090

EVALUATION OF A PROPOSED CONNECT WELL, NORTHEASTERN DESOTO COUN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W76-00095

PROJECT SKYWATER, AN INTRODUCT TO RIVERS IN THE SKY.
Bureau of Reclamation, Denver, Colo. Engin ing and Research Center.
December 1973, 31 p.

Descriptors: *Weather modifica *Precipitation(Atmospheric), *Cloud see *United States, Artificial precipitation, Rain Snow, Silver iodide, Cloud physics, Model dies, Mathematical models, Research development, Projects, Instrumentation, Env mental effects, Mountains, Federal governm Water resources, Chemistry of precipita Meteorology, Atmospheric physics.

Project Skywater is the Bureau of Reclamat precipitation management research pro designed to explore, develop and determin feasibility of applying the technology of we modification to meet the increasing deman clean water. Skywater is a national research e mobilizing members of the academic commu private research organizations, Bureau scien and numerous other federal and state age The focus is on the management of precipit and its effects on the environment. The pr

utilizes a broad spectrum of expertise in meteorology and the physical sciences, while placing important emphasis on ecological, social, and economic implications. The booklet presented an informal introduction to the program. A glossary of terms related to weather modification was included. (Sims-ISWS)
W76-00288

DESIGN AND FABRICATION OF A BOREHOLE LOGGING DEVICE FOR USE IN GROUND WATER OPERATIONS,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-00397

ELECTROMAGNETIC DEPTH SOUNDING FOR GROUND WATER EXPLORATION IN RESISTIVE FORMATIONS,
Indian Inst. of Tech., Kharagpur. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 4B.
W76-00398

SKIMMING OF FRESH WATER AFLOAT UPON SALT WATER,
Pant Univ. of Agriculture and Technology, Pantnagar, Govind Ballabh (India).
For primary bibliographic entry see Field 4B.
W76-00405

MANAGEMENT OF UNDERGROUND WATER RESOURCES,
University Coll., London (England).
G. P. Jones.
Quarterly Journal of Engineering Geology, Vol 4, No 4, p 317-328, 1972, 3 fig, 3 tab, 4 ref.

Descriptors: *Management, *Aquifer management, *Groundwater, *Water supply, *Groundwater mining, Demand, Economics, Safe yield, Water supply development, Irrigation, Hydrology, Optimum development.
Identifiers: Libya, United States, Israel.

The choice of water management practice depends partly on normal commercial exploitation and partly on its position as a life-essential. The underground 'resource' that is to be managed includes potable and non-potable waters whether they be in 'temporary' or 'permanent' storage, and consideration needs to be given to the use of non-potable aquifers for waste disposal purposes. Acceptance of management as the promotion of optimum regional welfare requires its introduction in the development of a water resources system at as early a stage as possible. The management scheme should give consideration to a wide range of user requirements and meet such demands from a number of devices at its disposal. Optimum performance will be obtained from widespread modification of the hydrological cycle by the integrated use of surface and subsurface resources. This requires a thorough understanding of all aspects of the cycle, and the degree of mutual interdependence of the components is illustrated. Examples of a variety of management schemes are briefly described and serve to show significant role played by hydrogeology in the design of these schemes. Water-resources management is dependent on specialist hydrological advice, but the status and career opportunities for scientists in this field have yet to achieve parity with those of engineers, and until such time as this is achieved then interdisciplinary study will remain desirable but not realizable. (Campbell-NWWA)
W76-00418

THE USE OF RESISTIVITY LOGGING TO ESTIMATE BOREHOLE YIELD FROM A MATRIX-CONDUCTING SANDSTONE,
Birmingham Univ. (England).
For primary bibliographic entry see Field 4B.
W76-00419

STUDIES OF SPECIFIC CAPACITIES OF WELLS IN HARD ROCKS AND ALLUVIAL FORMATIONS OF MYSORE STATE,
Central Ground Water Board, Bangalore (India).
For primary bibliographic entry see Field 4B.
W76-00485

SCREEN THEORY FOR WELLS AND SOIL DRAINPIPES,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 8B.
W76-00490

3C. Use Of Water Of Impaired Quality

WATER QUALITY-LIMITED APPROACH TO EFFLUENT REDUCTION IN PAPER MANUFACTURE,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, Mich. Central-Lake States Regional Center.
For primary bibliographic entry see Field 5G.
W76-00048

PINES ON A HIGH SALT DIET,
Soil Conservation Service, Cape May, N. J. Plant. Materials Center.
C. R. Belcher, and F. B. Gaffney.
Soil Conservation, Vol 40, No 2, p 11, September 1974.

Descriptors: Salinity, Salt, Saline water, Saline soil, *Pine trees, Seedlings, *New Jersey, *Salt tolerance.
Identifiers: *Japanese black pine.

Soil Conservation Service plant specialists in New Jersey are applying generous amounts of rock salt around pine seedlings. The purpose is to find pines resistant to salt water and salt spray along the seacoast. After testing white pine, Austrian pine, pitch pine and Japanese black pine, the latter was found to be most salt tolerant of the species. (Skogerboe-Colorado State)
W76-00154

GROWTH RESPONSE OF CROPS TO DEPTH AND SALINITY OF GROUND WATER, AND SOIL SUBMERGENCE. I. WHEAT (TRITICUM AESTIVUM L.),
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
T. N. Chaudhary, V. K. Bhatnagar, and S. S. Prihar.
Agronomy Journal, Vol 66, No 1, p 32-35, January-February, 1974. 3 fig, 4 tab, 10 ref.

Descriptors: *Salinity, *Saline soils, Saline water, *Crop response, Crop production, Groundwater, Lysimeters, *Wheat, Growth rates, *Salt tolerance.

Information on crop response to depth and salinity of groundwater and soil submergence is important for planning drainage and optimizing crop production. Response of a semidwarf wheat to four depths (60, 90, 120, and 150 cm) and three salinities (EC 0.5, 2.9, and 5.2 mmho/cm) of groundwater was studied in lysimeters filled with silt loam soil during 1970-71 and 1971-72. The plants were irrigated with water of EC 0.5 mmho/cm when the lysimeters with a 150-cm water table depth indicated a tension of 0.5 bar at a 75-cm depth. Groundwater of EC 0.5 mmho/cm at 60 and 90-cm depths gave highest yields. Comparable increase in the salinity of groundwater caused greater reduction in yield with shallow water tables than with deep water tables. Critical depth of groundwater, for optimum crop production, would vary in relation to its salinity. (Skogerboe-Colorado State)
W76-00156

WATER-QUALITY REQUIREMENTS FOR THE CHEMICAL INDUSTRY,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
For primary bibliographic entry see Field 5D.
W76-00284

3D. Conservation In Domestic and Municipal Use

CORPS URBAN PLANNING IN ST. LOUIS-MALINE CREEK: AN INTERDISCIPLINARY EFFORT,
Army Engineer District, St. Louis, Mo.
E. D. Rahubka, R. F. Astrack, S. V. Bailey, W. G. Dooley, and J. J. Zerega.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 281-308, 1975.

Descriptors: *Water resources development, *Planning, Decision making, Land resources, Drainage, Basins, Hydrology, Economics, Environment, Recreation, Design, Costs, Social aspects, Effects, Alternative planning, Mathematical models, *Missouri.
Identifiers: *Interdisciplinary analysis, *Maline Creek(Mo), St. Louis(Mo), Plan formulation, Urban planning, Modeling, Public participation, Improvement, Choice approach, Technical problems.

Reported is an interdisciplinary study to investigate the varied water and related land resource problems in the St. Louis-Maline Creek. The urban planning effort resulted from work done for the U.S. Army, Corps of Engineers, St. Louis District Office. The approach adopted utilizes the strength of technical experts to direct local decision making toward technically feasible alternative solutions. In this manner, local energies are concentrated and directed to meaningful efforts that are geared to creating needed improvements in a manner which is endorsed and supported by the citizenry affected. Considered are the technical aspects of the study, including plan improvement and objectives, hydrological-economic modeling of the Maline Creek basin to obtain frequency-damage data, the economic and environmental-recreational elements, and design-cost estimates. Considered also are potential synergistic social effects. The paper concludes with a discussion of institutional arrangements and public participation. The approach presented is a step in the direction of restricting technical expertise to technical problems and opening the basic decision making process to greater local influence. (See also W76-00060) (Bell-Cornell)
W76-00074

DISCUSSION (OF, 'CORPS URBAN PLANNING IN ST. LOUIS-MALINE CREEK: AN INTERDISCIPLINARY EFFORT,' BY E.D. RAHUBKA, ET AL.),
Corps of Engineers, San Francisco, Calif. South Pacific Div.
P. F. Dunn.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 309-311, 1975.

Descriptors: *Water resources development, *Comprehensive planning, Social aspects, Environmental engineering, Economics, Alternative planning, Water quality, Flood control.

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Identifiers: *Interdisciplinary analysis, *Plan formulation, Satisfaction level, Choice approach.

The paper by E. D. Rahubka, et. al provides an excellent case study of the type of social experiment faced by miltidisciplinary planning teams and shows clearly how mistaken it would be to allow a single discipline to attempt to solve such problems. This brief discussion critizes the plan formulation aspects of the study, while considering the fields of environmental engineering, economics, and political science. The author's comments focus on the setting and reaching of minimum acceptable satisfaction levels, and tough on flood protection, environment restoration benefits, water treatment, and double counting of benefits. (See also W76-00060) (Bell-Cornell)
W76-00075

DISCUSSION (OF, 'CORPS URBAN PLANNING IN ST. LOUIS-MALINE CREEK: AN INTERDISCIPLINARY EFFORT,' BY E.D. RAHUBKA, ET AL.),
Idaho Univ., Moscow.
E. L. Michalson.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 312-319, 1975.

Descriptors: *Water resources development, *Comprehensive planning, Urban sociology, Watersheds(Basins), Methodology.
Identifiers: *Interdisciplinary analysis, *Maline Creek(Mo), Improvements.

The Maline Creek planning effort is criticized and suggestions for improvement are offered. In general, more studies of this type should be done by the Corps across the country. The methodology is a commendable attempt to derive a procedure permitting public participation in the planning process. However, there exist a number of weaknesses: (1) a statement of the study objectives was omitted; (2) the scope was perhaps too broad and complex; (3) the study was multidisciplinary rather than interdisciplinary; (4) the status quo condition should have been considered as a planning alternative in order to determine the acceptance of the alternative improvment plans; (5) there were no numerical examples in the narrative; (6) the terminology used in the section referred to as Potential Synergistic Social Effects should have been further defined; and (7) there was no sociologist or political scientist in the planning group, thus weakening the section on social effects. Despite the weaknesses, a beginning was made in the integration of technical expertise and public involvement in the planning process, holding some promise for the future. (See also W76-00060) (Bell-Cornell)
W76-00076

EVALUATION AND IMPLEMENTATION OF URBAN DRAINAGE PROJECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-00201

LEAD, ZINC, AND COPPER IN SOILS OF URBAN STORM-RUNOFF RETENTION BASINS,
Agricultural Research Service, Fresno, Calif. Water Management Research.
For primary bibliographic entry see Field 5A.
W76-00307

EFFECT OF CESSPOOL DISCHARGE ON GROUND-WATER QUALITY ON LONG ISLAND, N.Y.,
Nassau County Health Dept. Mineola, N.Y. Environmental Conservation Programs.
For primary bibliographic entry see Field 5B.
W76-00308

PCB'S IN SUBURBAN WATERSHED, RESTON, VA.,
Federal Energy Administration, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00319

3E. Conservation In Industry

RIVER QUALITY AND INDUSTRIAL ADJUSTMENT: A CASE STUDY,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 5G.
W76-00039

WATER QUALITY-LIMITED APPROACH TO EFFLUENT REDUCTION IN PAPER MANUFACTURE,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, Mich. Central-Lake States Regional Center.
For primary bibliographic entry see Field 5G.
W76-00048

THE RECYCLING OF KRAFT BLEACH WASTES,
Montana State Univ., Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-00051

CHANGES IN RECIRCULATED WATER IN A PAPER MACHINE OVER A SIX DAY PERIOD (VERAENDERUNGEN IM KREISLAUFWASSER EINER PAPIERMASCHINE WAEHREND EINER 6 TAGE-BETRIEBSPERIODE),
Institut Papiertechnische Stiftung, Munich (Germany).
For primary bibliographic entry see Field 5D.
W76-00053

CONSIDERATIONS REGARDING OPERATION OF PAPER MILLS WITHOUT EFFLUENTS (GEDANKEN ZUM ABWASSERLOSEN BETRIEV VON PAPIERFABRIKEN),
Soehne (Julius Schulte) K. G., Duesseldorf-Bilk (Germany).
For primary bibliographic entry see Field 5D.
W76-00056

SLUDGE DEWATERING IN EFFLUENT PURIFICATION PLANTS OF THE PULP AND PAPER INDUSTRY WITH SPECIAL REFERENCE TO THE TWIN-BELT PRESS (SCHLAMMENTWAESSERUNG IN ABWASSERREINIGUNGS- ANLAGEN DER ZELLSTOFF-UND PAPIERINDUSTRIE UNTER BESONDERER BERUECKSICHTIGUNG DER DOPPELSIEBPRESSE),
Maschinenfabrik Andritz, A. G. Graz, (Austria).
For primary bibliographic entry see Field 5D.
W76-00057

WATER FOR WYOMING'S COAL,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 3B.
W76-00090

ON THE WASTE WATER TREATMENT SYSTEM BY PRESENT LANCY METHOD (GENJO NI OKERU RANSHI HOSHIKI NI YORU HAISUISHORI SHISUTEMU NI TSUITE),
For primary bibliographic entry see Field 5D.
W76-00132

WASTE WATER DISPOSAL OF PAINTI FACTORY AND CLOSED-SYSTEMATIZATI (TOSO KOJO NO HAISUI SHORI TO KUROZ DO-SHISUTEMU KA),
For primary bibliographic entry see Field 5D.
W76-00133

ARIZONA ENERGY INVENTORY: A REPO ON THE STATE'S ENERGY POSITION A OUTLOOK TO 1985,
Arizona Univ., Tucson. Div. of Economic Business Research.
For primary bibliographic entry see Field 6B.
W76-00196

AN ECONOMIC ANALYSIS OF THE P TERNS AND TRENDS OF WATER CONSU TION WITHIN THE SERVICE AREAS OF T HONOLULU BOARD OF WATER SUPPLY,
Hawaii Univ., Honolulu. Water Resou Research Center.
For primary bibliographic entry see Field 6D.
W76-00275

WATER-QUALITY REQUIREMENTS FOR T CHEMICAL INDUSTRY,
Du Pont de Nemours (E. I.) and Co., Wilming Del.
For primary bibliographic entry see Field 5D.
W76-00284

COOLING TOWERS AND WATER QUALIT
Environmental Science and Engineering, Gainsville, Fla.
For primary bibliographic entry see Field 5B.
W76-00316

RECLAMATION OF METAL VALUES FI METAL-FINISHING WASTE TREATM SLUDGES,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W76-00370

WILL TEXAS HAVE ENOUGH WATER THE ELECTRIC UTILITY INDUSTRY,
Texas Water Development Board, Austin. O tions Div.
For primary bibliographic entry see Field 6D.
W76-00421

CLOSED CIRCUIT PAPER MILL EFFLU TREATMENT.
For primary bibliographic entry see Field 5D.
W76-00496

3F. Conservation In Agriculture

THE WATER REGIME, ENZYMATIC AC TY AND FROST-RESISTANCE OF WIN WHEAT, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Physiology.
O. I. Kolosha, and I. I. Kostenko.
Dokl Vses Ord Lenina Akad S-Ku Kh Nauk I Lenina, No 3, p 11-14, 1973.

Descriptors: *Wheat, *Enzymes, Frost, Tem ture, Freezing, Dehydration, Organic matter.
Identifiers: Enzymatic activity, Fru ranosidase, Protease, Frost-resistant w Winter wheat.

Relationships between the frost-resistanc plants, the water regime and the activity of v enzymatic systems of seeds of winter wheat established. To a great extent these determin adaptability of plants to unfavorable tempera The nodes of frost resistant types conside

during freezing temperatures. They were characterized by low amount of ash and organic materials and a large amount of bound water. The activity of the hydrolytic enzymes beta-fructofuranosidase and proteases was higher in the frost resistant types. This was tied to the water regime of the cells. Creation of a water deficit at the end of spring vegetation increased the frost resistance of the winter wheat.--Copyright 1974, Biological Abstracts, Inc.
W76-00003

GROUNDWATER GEOLOGY OF SOUTHWEST NEBRASKA GROUND WATER CONSERVATION DISTRICT,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 4B.
W76-00005

UPPER CARSON RIVER WATER STUDY, WATER YEAR 1973,
Nevada Agricultural Experiment Station, Reno.
For primary bibliographic entry see Field 2D.
W76-00006

SOIL DETACHMENT FROM CLODS BY SIMULATED RAIN AND HAIL,
Agricultural Research Service, Manhattan, Kans.
For primary bibliographic entry see Field 2J.
W76-00030

WATER INTAKE UNDER CENTER-PIVOTS FROM TIME-VARYING APPLICATION RATES,
Nebraska Univ. Lincoln. Dept. of Agricultural Engineering.
J. W. Addink, D. L. Miles, and G. V. Skogerboe.
Tranactions of the American Society of Agricultural Engineers, Vol 18, No 3, p 523-528, May-June 1975. 4 fig, 3 tab, 14 ref.

Descriptors: *Irrigation, *Infiltration rates, *Sprinkler irrigation, *Rates of application, Application methods, Runoff, Sprinkling, Soils, Irrigation systems, Model studies, Mathematical models, Laboratory tests, Irrigation practices, Infiltration, Agriculture.
Identifiers: *Time-varying application rates, Center-pivot irrigation systems.

Design considerations of center-pivot sprinkler systems are different than those for conventional systems. Stationary sprinkler system design is primarily concerned with uniformity of water application. Sprinklers are selected so that application rates do not exceed intake rates. Center-pivot systems can easily have good application uniformities because of continually moving laterals and overlapping of many sprinkler patterns. However, the application rates of center-pivots sometime exceed the intake rates especially towards the end of the lateral. Resulting runoff moves from high spots and slopes to nearby low spots causing uneven water itake. Laboratory and model water-intake tests of application-rate patterns designed to reduce runoff were reported. Conclusions were: (1)forward-skewed application patterns have potential for reducing runoff under center pivots by 11% or more, and (2)percent reduction of runoff depends on the slope of the pattern and the soil type. (Sims-ISWS)
W76-00031

THE RELATIONSHIP BETWEEN SOLAR RADIATION, SOIL WATER, AND WATER POTENTIAL OF EARS OF WHEAT,
Lincoln Coll. (New Zealand). Dept. of Plant Science.
C. T. Dougherty.
New Zealand Journal of Agricultural Research, Vol 17, No 4, p 459-463, November 1974. 2 fig, 2 tab, 11 ref.

Descriptors: *Soil water, *Moisture tension, *Solar radiation, *Wheat, Crop response, Plant growth, Irrigation effects, Irrigation, Crop production.
Identifiers: Water potential of ears of 'Kopara' wheat grown in the field with or without irrigation were measured by pressure bomb between 0900 and 1000 h and related to soil water and solar radiation. Water potentials of ears from irrigated wheat ranged from -2 to -14 bars, and from -8 to -27 bars in ears from non-irrigated plots. Ear water potentials between 0900 and 1000 h were related to soil water percentage and mean solar radiation received between 0700 and 0800 h. (Skogerboe-Colorado State)
W76-00150

EFFECTS OF IRRIGATION AND FERTILISER ON THE YIELDS OF 'ARAWA', 'AOTEA', AND 'KARAMU' WHEATS,
Lincoln Coll. (New Zealand). Dept. of Plant Science.
C. T. Dougherty, W. R. Scott, R. H. M. Langer, and G. Meijer.
New Zealand Journal of Agricultural Research, Vol 17, No 2, p 241-249, May 1974. 3 fig, 5 tab, 30 ref.

Descriptors: *Fertilization, *Fertilizers, *Irrigation practices, *Wheat, Irrigation effects, Plant growth, Nitrogen, Agronomic crops.

Grain yields of 'Aotea', 'Arawa', and 'Karamu' wheats were depressed by irrigation during early stages of reproductive development which reduced the number of grains per spikelet and slowed the rate of reproductive development. Nitrogen fertilizer increased the ear population at harvest but had little effect on the dry weight or leaf area of the tillers during the critical pre-anthesis stage or on the mean values of the components of yield of the ears. There were no interactions between fertilizer and irrigation treatments. 'Karamu', a Mexican semi-dwarf, was similar to the New Zealand-bred wheats except that it had slightly more spikelets per ear and grains per spikelet, but it had smaller grains. An antitranspirant applied to irrigated wheat had no effect on any of the components of grain or straw yield. Responses were interpreted on the basis that pre-anthesis assimilate levels were modified by agronomic treatments and affected grain set. (Skogerboe-Colorado State)
W76-00151

AN ANALYSIS OF A NITROGEN-INDUCED DEPRESSION OF YIELD IN IRRIGATED 'KOPARA' WHEAT,
Lincoln Coll. (New Zealand). Dept. of Plant Science.
C. T. Dougherty, and R. H. M. Langer.
New Zealand Journal of Agricultural Research, Vol 17, No 3, p 325-331, August 1974. 2 fig, 7 tab, 20 ref.

Descriptors: *Fertilization, *Fertilizers, Moisture tension, Nitrogen, *Wheat, Crop response, Plant growth.

Heavy applications of nitrogen fertilizer (200 kg/ha) applied in early spring to wheat on a Wakanui silt loam, in which irrigation was used to maintain soil-water levels above -0.5 bar, depressed grain yield by 30%. Poor grain set was the main cause of the low yields, but mean grain weights were also reduced. Analysis of data indicated that grain set was probably restricted by the availability of carbohydrate during the critical pre-anthesis period of floret development. (Skogerboe-Colorado State)
W76-00152

PREDICTING NITROGEN FERTILIZER REQUIREMENTS AFTER LAND LEVELING,
Agricultural Research Service, Weslaco, Tex.
J. R. Thomas, M. D. Heilman, and L. Lyles.
Agronomy Journal, Vol 66, No 3, p 371-374, May-June, 1974. 5 fig, 4 tab, 6 ref.

Descriptors: Fertility, Fertilization, *Fertilizers, *Land forming, Land reclamation, Land development, Crop response, *Nitrogen, *Crop production.

Reduced yields and nutrient-deficient crops on cut areas after land leveling are recognized problems. The objectives of this study were to determine if the variability in crop production between cut and fill areas of leveled fields could be minimized without overfertilization by adjusting the soils to a uniform level of available N based on the soils' capacity to supply N (N index) and to relate the N fertilizer requirement to the N index. Five leveling methods which resulted in the removal of different amounts of top soil were used. Soils from leveled and nonleveled areas were incubated and the soils' capacity to supply N were described by a regression model. With a 14-day incubation, the nonleveled soils supplied N at the rate of 174 kg/ha. Therefore, based on the leveled soils' ability to supply N in this time period, sufficient NH4NO3 fertilizer was applied to establish N levels of 174, 219, and 263 kg/ha. The leveled fields were cropped to forage sorghum. Dry matter forage yields, N uptake, and the growth rate during the first 19 days of growth were significantly related to the N index. (Skogerboe-Colorado State)
W76-00155

INFLUENCE OF ORGANIC NITROGEN ON SOIL NITROGEN, NODULATION, NITROGEN FIXATION, AND YIELD OF SOYBEANS,
Maryland Univ., College Park. Dept. of Agronomy.
D. F. Bezdicek, R. F. Mulford, and B. H. Magee.
Soil Science Society of America Proceedings, Vol 38, No 2, p 268-273, March-April, 1974. 2 fig, 5 tab, 17 ref.

Descriptors: *Fertilization, Nitrogen, Nitrogen fixation, *Soybeans, Crop response.
Identifiers: Nodulation, Organic nitrogen, Rye, Soil nitrogen.

Nitrogen was applied on a previous rye cover crop for later determination of the effect of organic N on soybean, N2-fixation rate, plant dry matter, N uptake, and yield. Nitrogen was applied at 0, 56, 112, and 224 kg N/ha as NH4NO3 or urea either on rye in mid-March or at soybean planting time in a 4 x 2 x 2 factorial design. In both years of study, N2-fixation rate as estimated from acetylene reduction was reduced throughout the season by increased fertilization rate. For 1 year, interactions shows that N2-fixation rate and nodule mass were stimulated late in the season from increased N fertilizer appled to the rye but not at soybean planting. Interactions between NH4NO3 and urea and time of application showed that NH4NO3 as compared with urea applied on rye significantly increased soybean dry matter, N uptake, and yield. Urea applied at planting increased these paramters in comparison with NH4NO3. The observed increases in dry matter, N uptake and yield from rye-applied NH4NO3 were not accompanied by a corresponding increase in N2-fixation rate or nodule mass. This would suggest that the N2 fixing system was not responsible for the increase of dry matter, N-uptake, and yield. Soil organic N was not measurably influenced by the treatments imposed. (Skogerboe-Colorado State)
W76-00157

SURFACE IRRIGATION,
California Univ., Davis; and Food and Agriculture Organization of the United Nations, Rome (Italy) Land and Water Development Div.
L. J. Booher.
Food and Agriculture Organization of the United Nations, Rome, Agricultural Development Paper No 95, 1974. 174 p, 83 fig, 24 tab, 70 ref.

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Descriptors: *Irrigation, *Distribution systems, *Irrigation systems, *Surface irrigation, *Water supply, Irrigation practices, Flood irrigation, Furrow irrigation, Border irrigation, Irrigation canals, Irrigation design, Irrigation ditches, Water sources, Arable land, Water requirements, Moisture content, Land use, Pipes, Crop production, Soil water movement.
Identifiers: Tricle irrigation, Irrigated soils, Land preparation.

Although only 15 to 20 percent of the world's crop land is under irrigation, the production from irrigated land amounts to as much as 30 to 40 percent of total world agricultural output. Surface systems comprehensive survey of all the several existing surface systems. Their combination in this volume makes possible the study and comparison of the various parameters of soil, water supply, topography and cropping possibilities of these systems, as well as their technical requirements, practical application and costs; useful knowledge in the selection and planning of an irrigation scheme. (Robinett-Arizona)
W76-00192

THE EFFECTS OF CLIMATE ON WATER USE IN CANTERBURY IRRIGATION SCHEMES,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
For primary bibliographic entry see Field 2G.
W76-00194

EVALUATION OF AN OVER-EXTENDED SPRINKLER IRRIGATION SYSTEM,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
H. C. Korven, and J. K. Wiens.
Canadian Agricultural Engineering, Vol 16, No 2, p 51-57, December 1974. 4 fig, 6 tab, 7 ref.

Descriptors: *Sprinkler irrigation, *Irrigation practices, Irrigation systems, Evaluation, Consumptive use, Cost analysis, Crop production.

Maximum production under irrigation requires a system with the capacity to meet the peak water requirements of the plant. Surface irrigation systems, particularly the border dyke method fed by gravity water, are designed and operated so that elapsed time required to irrigate a field (Irrigation cycle) is much shorter than the elapsed time between irrigations (Irrigation interval). Sprinkler irrigation systems, irrigatin interval is used for the irrigation cycle. The main reason for this is one of economics. The cost of the system is decreased as more of the available irrigating time is used for irrigating. The purpose of this study was to examine the yields and economic ramifications of using a sprinkler irrigation over a larger area than that determined by the normal criterion of designing the system to meet peak water requirements. (Skogerboe-Colorado State)
W76-00198

IMPROVEMENT OF WATER APPLICATION OF SELF-PROPELLED SPRINKLER IRRIGATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
A. D. Barefoot.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 762, $3.25 in paper copy, $2.25 in microfiche. Completion Report, (1975). 17 p, 3 fig, 7 tab, 10 ref. OWRT A-040 OKLA(1). 14-31-0001-4036.

Descriptors: *Irrigation systems, *Sprinkler irrigation, *Uniformity coefficient, Trafficability, *Evapotranspiration, Evaporation, Winds, Root zone, *Oklahoma.
Identifiers: Center-pivot sprinkler irrigation.

The number of center-pivot sprinkler irrigation systems is increasing in the central Great Plains. The reason for this increase are their labor-saving advantages and versatility. The system's ability to irrigate rolling terrain with a wide range of application depths accounts for its versatility. The objectives of this project were to evaluate the depth and uniformity of application of a center-pivot system and to determine the depth of water stored in the crop root zone, evaporation losses and trafficability problems of a typical system during field conditions. Data were collected from a 1300 foot, electrically driven system. Both size and spacing of the nozzle heads are varied to obtain desired application rates on this system. The soil type was sand and the crop was peanuts. The average coefficient of uniformity was 85.2 with a standard deviation of 2.48. The uniformity appeared to decrease linearly with wind speed for the range tested. The average value of evapotranspiration was 0.186 inches per day for the entire growing season. The average evaporation loss was 15.5 percent with 20.4 percent occuring during daytime irrigations and 10.6 percent at night. No trafficability problems were encountered on the sandy soil. Five systems were tested in the Oklahoma Panhandle. The systems varied in both design and lengths. Three of the systems were electrically powered and two were water driven. The average coefficient of uniformity for the five systems was 81.7. Only minor traction problems were observed in the clay loam or loam soils.
W76-00200

FERTILIZER APPLICATION RATES AND NITRATE CONCENTRATIONS IN ILLINOIS SURFACE WATERS,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 5B.
W76-00290

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST: PART III - NEVADA,
Aricona Univ., Tucson. Dept. of Agricultural Economics.
N. G. Wright, E. R. Barmettler, T. M. Stubblefield, and D. A. Swope.
University of Arizona, Agricultural Experiment Station, Technical Bulletin 217, June, 1975. 28 p, 1 fig, 15 tab, 2 ref, 15 append.

Descriptors: *Cost comparisons, *Estimated costs, *Farm management, *Crop production, *Irrigation, Costs, Comparative costs, Prices, *Nevada, Agriculture, Alfalfa, Arable land, Cereal crops, Crops, Farm prices, Hay, Irrigated land, Irrigation efficiency, Southwest U.S., Budgeting, Semiarid lands.

Costs of producing crops in Nevada were determined in such a manner as to be comparable with similar costs in other states. A synthetic budgeting method was used, and costs were based on the more efficient uses of agricultural inputs, at 1972 prices. Of the approximate 500,000 acres of irrigated cropland in Nevada, in 1970 and 1971, about 88 percent was hay, 4 percent alfalfa seed, and about 6 percent grain. Production cost estimates for alfalfa hay in northeastern Nevada were $33.80/ton, in western Nevada $31.81, and $31.87 in southern Nevada. The northeast was the highest cost area, producing hay and small grains to feed livestock through the winter. There was not enough difference in cost among areas to encourage any production shift from one area to another. (Robinett-Arizona)
W76-00383

INTERIM REPORT ON DEVELOPMENT OF A HAND OPERATED WATER PUMP FOR DEVELOPING COUNTRIES,
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 8C.
W76-00420

CONSEQUENCES OF WASTE DISPOSAL O LAND,
Agricultural Research Service, St. Paul, Minn. S and Water Conservation Research Div
For primary bibliographic entry see Field 5E.
W76-00427

PRINCIPLES OF NUTRIENT CONTROL F AGRICULTURAL WASTEWATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultu Engineering.
For primary bibliographic entry see Field 5B.
W76-00431

THE EFFECT OF SOIL MOISTURE ON C TENT OF VARIOUS FRACTIONS OF PROTI NITROGEN IN PLANTS, (IN AZERBAIJA AN),
B. Z. Guseinov, and G. A. Rzaev.
Izv Akad Nauk Az SSR Ser Biol Nauk., No 3, 10. 1972.

Descriptors: *Soil moisture, *Proteins, *Nitro *Wheat, Beans, Moisture content, *Crop proc tion, Crop response.
Identifiers: *Kidney beans.

Under vegetative conditions the authors obser the effect of soil moisture (Minimal, normal increased) on protein nitrogen fraction retentio wheat and kidney bean. Minimal and increa moisture had a negative effect, lowering the re tion of protein fractions. Increased moisture of soil has a particularly negative effect as compa to minimal and normal moisture. In wheat du optimal moisture there is an increase hydrophilous colloids and their hydration ar higher yield of grain. In plants grown on inst cient and overabundant soil moisture no cor tion was found between hydrophilous colloids yield and moisture of the soil.--Copyright 1 Biological Abstracts, Inc.
W76-00450

PREDICTION OF PLANT RESPONSE TO F TILISERS BY MEANS OF SOIL TESTS,
Department of Agriculture, Mosgiel (New land). Invermay Agricultural Research Center.
J. L. Grigg, and R. C. Stephen.
New Zealand Journal of Agricultural Resea Vol 17, No 1, p 31-40, February 1974. 1 fig, 7 15 ref.

Descriptors: *Fertilizers, *Fertilization, * response, *Soil tests, Wheat, Phosphate, production, Plant growth.

Data from 82 rates-of-fertilizer trials on whea which double superphosphate was the sourc phosphate, were used to evaluate the predict ty of grain yield responses from soil-test meas ments. Yield data were reduced to single va for correlations with soil phosphorus tests by culating (a) relative yields % and (b) the first cipal components of the yield response. Re sion of these parameters on values from eigh ferent soil tests, using a quadratic model ir square root scale, showed that the Olsen soi modified to 16-h extraction and a soil: solu ratio of 2.2 ml: 100 ml accounted for more va tion than other soil tests examined. The co tions with soil tests were closer for the rel yields than for the first principal compon (Skogerboe-Colorado State)
W76-00491

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ANALYSIS OF FLOW THROUGH VEGETATION,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
S. Petryk, and G. Bosmajian, III.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11457, p 871-884, July 1975. 9 fig, 15 ref, 2 append.

Descriptors: *Vegetation, *Vegetation effects, *Open channel flow, Flow resistance, Flow around objects, Flow friction, Aquatic weeds, River flow, Streamflow, Mannings equation, Drag, Flood plains, Roughness coefficient, Model studies, Channels.
Identifiers: Flow through vegetation, Vegetation density, Vegetation roughness.

The Manning n value was quantitatively evaluated for flow in heavily vegetated channels. Momentum analysis showed that the composite n value as a function of flow depth is dependent on the bottom roughness and the density of vegetation. In some cases, the vegetation density can be evaluated directly from physical measurements of the vegetation. However, in most situations, it must be evaluated indirectly from limited field data. The results showed that the n value increases in proportion to two-thirds power of the hydraulic radius for conditions where the vegetation density is a constant over the flow depth. Field application of the flow resistance model were described for projects concerned with flood routing, backwater computations, extension of rating curves, channel improvement work, and erosion control. (Terstriep-ISWS)
W76-00015

INTERDISCIPLINARY STUDIES OF LARGE RESERVOIRS IN AFRICA,
Colorado Univ., Boulder.
G. F. White.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 63-85, 1975. 3 fig, 2 tab, 5 ref.

Descriptors: *Water resources, *Reservoirs, *Africa, Effects, Social impacts, Rivers, Ecosystems, United Nations, Design, Operations, Mathematical models.
Identifiers: *Interdisciplinary studies, *Man-made lakes, Impact analysis, Prediction, Salvage studies, Agencies.

The need to salvage maximum social benefits from reservoirs previously constructed primarily for hydroelectric power purposes initiated four interdisciplinary investigations of the effects of man-made lakes in Africa, under way since the mid-1960's. The reservoirs are the Kariba on the Zambezi, the Nasser on the Nile, the Kainji on the Niger, and the Volta on the Volta River. In each case, the United Nations Development Programme joined with the responsible national group to support investigations which included the assessment of likely effects of the reservoir on social systems and the alternative measures open to deal with such effects. The principal effects included dislocation, human health, agricultural productivity, fishing, wildlife resources, and recreation. The major disciplines involved in the resulting scientific investigations included anthropology, aquatic biology, terrestrial biology, fisheries, economics, geography, engineering, limnology, and sociology. Among the problems encountered in carrying out such investigations effectively were the divisions of administrative authorities, the conflicts among responsible local and national agencies, the lack of a language for scientific communication, the difficulty of relating basic investigations to the likely application of results, and the transitory nature of the investigations. (See also W76-00060) (Bell-Cornell)
W76-00065

DISCUSSION (OF, 'INTERDISCIPLINARY STUDIES OF LARGE RESERVOIRS IN AFRICA,' BY G. F. WHITE),
Engineering-Science, Inc., Cincinnati, Ohio.
R. M. Males.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 86-94, 1975.

Descriptors: *Communication, *Information exchange, *Water resources, Africa, Evaluation, Value, Projects, Ethics, Reservoirs.
Identifiers: *Interdisciplinary studies, Salvaging, Reporting.

Males discusses the character and value of communication about interdisciplinary studies and makes recommendations for what he feels should be communicated. He uses White's paper, 'Interdisciplinary Studies of Large Reservoirs in Africa,' to elucidate and support his own contentions. At present, the majority of knowledge in interdisciplinary studies is experimental; since it is difficult to comment on others' experiential knowledge, a major effort should be to discover what can legitimately be talked about in this field. Considered are the ethics of work and reporting in this field; also considered are traditional disciplinary studies and reporting. Meaningful interdisciplinary studies of significant problems involve the question of distribution of power, both within political/social institutions and between/within disciplines. White discusses the difficulties of keeping project team members problem-, rather than process-, oriented. White's experiences support Males' contention that according all disciplines equal status and making all efforts group, or team, efforts, is not workable. White's points on reliability of analysis and routes to goals cannot be overemphasized. Males criticizes that White gives unfamiliar references (a problem inherent in interdisciplinary reporting) and uses figures (diagrams) not of his own creation. Three basic arenas for communication/information transfer relative to interdisciplinary studies are: (1) awareness of what we are doing (i.e., social optimum); (2) development of guiding principles and unifying concepts; and (3) tools (hardware, software, and people). (See also W76-00060) (Bell-Cornell)
W76-00066

INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS OF THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 2H.
W76-00067

AN ASSESSMENT OF UNIVERSITY INTERDISCIPLINARY RESEARCH: THE WISCONSIN RIVER AND THE LOWER FRASER RIVER WATER QUALITY STUDIES,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5G.
W76-00077

DISCUSSION (OF, 'AN ASSESSMENT OF UNIVERSITY INTERDISCIPLINARY RESEARCH: THE WISCONSIN RIVER AND THE LOWER FRASER RIVER WATER QUALITY STUDIES,' BY A. H. J. DORCEY AND I. K. FOX),
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 5G.
W76-00078

CEDAR CREEK AT CEDARTOWN, GEORGIA--FLOOD FLOW CHARACTERISTICS AT BRIDGE SITE OF GEORGIA AVENUE RELOCATION (SUPPLEMENT TO OPEN-FILE REPORT 75-46),
Geological Survey, Doraville, Ga.
M. Price.
Open-file report 75-332, July 1975. 6 p, 3 fig, 1 tab.

Descriptors: *Flood data, *Flood frequency, *Flood forecasting, *Highway relocation, *Georgia, Hydrologic data, Streamflow, Flow characteristics, Flood plains, Road construction, Planning.
Identifiers: Cedartown(Ga), *Cedar Creek(Ga).

This report shows changes made after the May 1974 U. S. Geological Survey open-file report 75-46 'Cedar Creek at Cedartown, Georgia, Floodflow Characteristics at Georgia Avenue, Relocation and Canal Street Extension,' prepared at the request of the Georgia Department of Transportation. The original report described the hydraulic characteristics of the Georgia Avenue relocation as constructed in April 1974, and evaluated the effects of three proposed changes in roadway grades at this crossing. The purpose of the change in the roadway and side road grades is to reduce the backwater effect of the highway crossing so that the 5-year flood (6,700 cfs) will produce backwater less than 0.1 foot and the 50-year flood (13,000 cfs) will produce backwater less than 0.5 foot. The backwater effect of the April 4, 1974 flood (12,700 cfs) was determined from field surveys and is used as the approximate 5-year flood because availability of accurate field data. The 50-year flood was estimated to be 13,200 cfs from a frequency curve. (Woodard-USGS)
W76-00084

SMALL-STREAM FLOOD INVESTIGATIONS IN MINNESOTA, OCTOBER 1958 TO SEPTEMBER 1973,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-00085

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1972-73 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-00086

SIMULATION OF WATER-AND VAPOR-DOMINATED HYDROTHERMAL RESERVOIRS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W76-00087

WATER FOR WYOMING'S COAL,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 3B.
W76-00090

WATER RESOURCES OF GOVE, LOGAN, AND WALLACE COUNTIES, WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W76-00093

LIBRARY U. OF I. URBANA-CHAMPAIGN

WATER RESOURCES OF WISCONSIN-UPPER WISCONSIN RIVER BASIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 7C.
W76-00094

WATER MANAGEMENT MODEL IN FLORIDA FROM ERTS-1 DATA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 7B.
W76-00096

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM OGEECHEE RIVER TO CARRABELLE RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00100

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 2. UPPER COLUMBIA RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00101

HYDROLOGY OF THE SALT RIVER AND ITS RESERVOIRS, CENTRAL ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 2H.
W76-00189

INFLUENCE OF PRECIPITATION ON PERENNIAL GRASS PRODUCTION IN THE SEMIDESERT SOUTHWEST,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
D. R. Cable.
Ecology, Vol 56, p 981-986, Summer, 1975. 1 fig, 4 tab, 13 ref.

Descriptors: *Semiarid climates, *Range grasses, *Rainfall, *Water requirements, *Plant growth, *Southwest U. S., *Arizona, *Grasses, Grasslands, Deserts, Range management, Wet seasons, Meteorology, Weather, Water supply, Shrubs, Mesquite, Desert plants.
Identifiers: *Perennial grasses, Santa Rita Experimental Range(Ariz), Grass production, Perennial grass production, Rainfall effects.

Perennial grass production in the semidesert grass-shrub type was dependent primarily on current summer rainfall and previous interaction effect, not a direct effect. The best overall relationship involved current August rainfall, previous June through September rainfall, and the interaction product of these two. However, an interaction product alone yielded estimates essentially as good as the multiple regression, and explained 64%-91% of the year-to-year variability in grass production. Winter precipitation had no consistent effect on perennial grass production the following summer. The depressing effect of mesquite on perennial grass production was most noticeable at low rainfall levels, and became minor at high rainfall levels. (Robinett-Arizona)
W76-00195

EVALUATION AND IMPLEMENTATION OF URBAN DRAINAGE PROJECTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg.
Journal of the Urban Planning and Development Division, Proceedings of ASCE, Vol 101, UP1, p 61-75, May, 1975. 6 fig, 1 tab, 32 ref, append.

Descriptors: *Urban drainage, *Cities, *Flood control, *Project planning, Cost-benefit analysis, Urbanization, Drainage systems, Administration, Decision making, Financing.

The service that urban drainage and flood control systems (UDFC) provide to urban areas has three basic components: flood control; convenience drainage; and, environmental sanitation. Since this service is provided by local governments it must compete for public funding with other more visible programs such as education, transportation, and public safety. This paper details the practical aspects of evaluating an urban drainage and flood control project. The evaluation problem must consider the merit of individual UDFC systems, the ranking of competing UDFC projects, the optimal investment timing, and the incidence of UDFC benefits and costs. UDFC systems are considered to be either minor systems, which provide for the drainage of frequent runoff events, or major systems, which provide for the rarer and more severe events. Financial savings can be realized by cities which use valid and incisive evaluation techniques in the planning, programming and budgeting steps of urban drainage and flood control projects. (Orr-FIRL)
W76-00201

THE TERASSPERC-A PROPOSED SI UNIT FOR THE FREQUENCY OF RECURRENCE OF A HYDROLOGICAL EVENT,
Bradford Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 7A.
W76-00297

A MATHEMATICAL MODEL FOR FORECASTING THE FLOW OF THE SOLA RIVER,
Gdansk Technical Univ. (Poland).
For primary bibliographic entry see Field 2A.
W76-00298

FINITE ELEMENT SIMULATION OF FLOOD HYDROGRAPHS,
Virginia Polytechnic Institute and State University, Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W76-00303

SKEW INPUTS AND THE HURST EFFECT,
Ain Shams Univ., Cairo (Egypt).
A. A. Anis, and E. H. Lloyd.
Journal of Hydrology, Vol 26, No 1/2, p 39-53, July 1975. 3 tab, 9 ref.

Descriptors: *Statistical methods, *Reservoir storage, *Withdrawal, *Time series analysis, *Analytical techniques, Distribution patterns, Hydrologic data, Frequency, Inflow, Model studies, Geophysics.
Identifiers: *Hurst effect, Skew inputs.

Hurst plotted values of logarithms of rescaled Hurst range versus the logarithm of years of record, n, and determined an expression for this range by passing the fitted line through the origin. The results would have been more general if the intercept had been kept independent of the Hurst exponent and allowed to vary from one set of data to the other. For models in which annual flows are identically distributed independent random variables, the logarithm of range varies with the logarithm of n only for rather large values of n, the slope of the line being 0.5. Extrapolation backward of the fitted line yields an intercept independent of the Hurst exponent. The conformity of a mathematical model to Hurst's empirical law is not determined by its asymptotic properties but rather by its behavior over the relevant interval of finite n-values, say 100 to 1000 years. For gamma-distributed inflows with appropriate shape parameter, the adjusted range of cumulative sums has a local Hurst exponent in the neighborhood of 0.75 over the desired time interval. Attention w drawn to the desirability of investigating whethe similar result might hold for the rescaled range these inputs. (Singh-ISWS)
W76-00317

A STUDY OF THE MEXICAN DUCK (AN DIAZI) IN SOUTHEASTERN ARIZONA,
Arizona Game and Fish Dept., Phoenix
For primary bibliographic entry see Field 2I.
W76-00381

OUTDOOR RECREATION IN THE SAI VERDE BASIN OF CENTRAL ARIZONA: I MAND AND VALUE,
Arizona Univ., Tucson. Dept. of Agricult Economics.
For primary bibliographic entry see Field 6B.
W76-00382

WATER AND THE WEST: THE COLORA RIVER COMPACT AND THE POLITICS WATER IN THE AMERICAN WEST,
California Univ., Los Angeles. Dept. of History
For primary bibliographic entry see Field 6E.
W76-00384

HYDROLOGY AND CHARACTERISTICS FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5B.
W76-00435

4B. Groundwater Management

GROUNDWATER GEOLOGY OF SOUTHWE NEBRASKA GROUND WATER CONSER TION DISTRICT,
Nebraska Univ., Lincoln. Conservation and S vey Div.
G. J. Leonard, and P. W. Huntoon.
Nebraska Water Survey Paper No 37, May 1 37 p, 16 fig, 3 tab, 19 ref.

Descriptors: *Groundwater, *Irrigat *Hydrogeology, *Nebraska, Aquifers, W table, Water levels, Wells, Irrigation w Groundwater availability, Groundwater resour Climatology, Rainfall, Temperature, Drawdo Hydrulic conductivity, Transmissivity, W storage, Streamflow, Water supply, Agricultur
Identifiers: Chase County(Neb), Dundy C ty(Neb).

Use of groundwater for irrigation in Chase Dundy counties, Nebraska, has increased tren dously during the past two decades. At the tim an earlier study (1953), less than 70 irrigation w had been drilled in the area; but when this st was made (1973), nearly 1000 irrigation wells been registered. The Ogallala Formation Pliocene age is the source of virtually all the w pumped; alluvial deposits supply the s remainder. An estimated 177,000 acre-fee water was pumped for irrigation in 1973. Grou water withdrawals to date have caused the w table to decline more than 10 feet in two areas, in the vicinity of Chase and Lamar in Chase C ty and the other in north-central Dundy Cou Because water levels have lowered throughc large part of the area drained by French Creek, the point at which the creek becomes a stream has migrated downstream and the flow of the creek has decreased. Part of the lo ing of water levels is probably due to less-t normal precipitation in recent years. (Sims-ISW
W76-00005

THE SOLUBILITY OF FERRIC OXYHYDR IDES IN NATURAL WATERS,
Kansas State Univ., Manhattan. Dept. of Geol
For primary bibliographic entry see Field 2K.

W76-00011

GROUND-WATER QUALITY IN THE SHIRAZ BASIN, SOUTH IRAN,
Tehran Univ., (Iran). School of Engineering.
For primary bibliographic entry see Field 2K.
W76-00012

A HELE-SHAW ANALOG STUDY OF THE SEEPAGE OF GROUNDWATER RESTING ON A SLOPING BED,
Cambridge Univ., (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 2F.
W76-00025

TRANSIENT WELL-FLOW IN AN UNCONFINED-CONFINED AQUIFER SYSTEM,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
M. H. A. Khader, and M. K. Veerankutty.
Journal of Hydrology, Vol 26, No 1/2, p 123-140, July 1975. 8 fig, 2 tab, 21 ref.

Descriptors: *Groundwater, *Unsteady flow, *Confined water, *Mathematical studies, Aquifers, Drawdown, Aquifer testing, Numerical analysis, Potentiometric level, Equations, Groundwater movement, Water wells, Wells, Mathematics, Hydraulic properties, Laplaces equation, Dual system, Water table.
Identifiers: Type curves, Drawdown distribution, Multi-layered aquifers.

Equations for transient flow to a well penetrating two aquifers--a water table aquifer overlying a confined aquifer--were derived. Two cases were considered for analysis. In the first case, flow towards a well of zero discharge with different initial heads was analyzed. In the second case, the solution was obtained for a well penetrating two aquifers with a constant discharge and identical initial heads. Schapery's method of inversion for Laplace transform was used in the analysis. Solutions of these two cases were combined to obtain general solutions for different field conditions. From the equations derived, it was also possible to calculate the contributions from individual aquifers to the total discharge. Important results of the analysis were given in tables and charts using the usual range of values of different parameters. (Prickett-ISWS)
W76-00029

ENVIRONMENTAL MONITORING: A NEW REQUIREMENT FOR THE MINING INDUSTRY,
For primary bibliographic entry see Field 5A.
W76-00037

INTERDISCIPLINARY APPROACH TO GEOTHERMAL DEVELOPMENT,
Bureau of Reclamation, Boulder City, Nev. Regions.
M. K. Fulcher.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 194-208, 1975.

Descriptors: *Geothermal studies, *Water resources development, *Environmental effects, Water supply, Saline water, Drilling, Subsidence, Water quality, Energy, Electric power, Ecology, Brines, Wells, Alternative planning, Colorado River.
Identifiers: *Interdisciplinary analysis, *Imperial Valley(Cal), Production water, Bureau of Reclamation.

Geothermal systems provide the potential to meet pressing water and power demands of the near future. Considered is the study and development of geothermal resources, focusing on the necessity for broad interdisciplinary analysis. To relate the need for an interdisciplinary approach to a specific case, the Bureau of Reclamation's geothermal resources investigation in Imperial Valley, California is described. In the Imperial Valley, and in the vast majority of know geothermal deposits, heat is stored as hot fluid, providing the potential for economical new supplies of fresh water through desalting, concurrent with the production of electricity. The Bureau's concept for development here involves three stages. Stage one would, through extensive geological, geophysical, and water chemistry investigations, determine the potential and extent of the geothermal resource. Stage two would demonstrate the feasbility of a large-scale development. In the third state, large-scale development, the flows of the Colorado River would be augmented by as must as 2.5 million acre-feet of desalted water annually with electric power production of about 10,000 megawatts. Considered is the broad spectrum of technical, environmental, and social factors involved in such a development plan. A lead agency can continually coordinate the comprehensive, interdisciplinary input. Thus, a true evaluation can be made of the cumulative impacts resulting from geothermal resource development. Insights from all disciplines are essential for most effective development and for a realistic and comprehensive perspective of alternatives. (See also W76-00060) (Bell-Cornell)
W76-00070

DISCUSSION (OF, 'INTERDISCIPLINARY APPROACH TO GEOTHERMAL DEVELOPMENT,' BY M. K. FULCHER),
California Univ., Los Angeles.
E. A. Engelbert.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 209-219, 1975.

Descriptors: *Geothermal studies, *Planning, *Regions, Economics, Social aspects, Legal aspects, Water policy, Energy, Costs, Research and development, Coordination, Effects, *California.
Identifiers: *Interdisciplinary analysis, *Imperial Valley(Cal), Environmental impact statements.

In response to M. K. Fulcher's paper, Engelbert focuses upon the need for social-economic analysis concerning policies that should govern geothermal resources development in southeastern California before major development gets under way. Engelbert recommends this approach over that of Fulcher, who concentrates on socio-economic analysis of what the after-consequences may be. According to Engelbert, it is the policies which will govern the commencement of large-scale geothermal development which will in turn greatly determine the subsequently ensuring undesirable socio-economic impacts. Considered herein are some of the major policy issues which urgently need to be pursued and answered. Included are legal considerations, development policies, energy policy, water policy, and regional planning and coordination. The author is in full agreement with Fulcher's statement that 'the insights from all disciplines are essential for most effective development and for a realistic and comprehensive perspective of alternatives'. Most critical for public policy now, believes Engelbert, is sorting out priorities and options before major development begins so that the nation will derive optimum benefits from this resource. (See also W76-00060) (Bell-Cornell)
W76-00071

STRESS DETERMINATION BY HYDRAULIC FRACTURING IN SUBSURFACE WASTE INJECTION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5E.
W76-00089

THE DETERMINATION OF SPECIFIC FORMS OF ALUMINUM IN NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-00091

GEOLOGIC MAP SHOWING SPRINGS RICH IN CARBON DIOXIDE OR CHLORIDE IN CALIFORNIA,
Geological Survey, Menol Park, Calif.
For primary bibliographic entry see Field 7C.
W76-00092

WATER RESOURCES OF GOVE, LOGAN, AND WALLACE COUNTIES, WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W76-00093

WATER RESOURCES OF WISCONSIN-UPPER WISCONSIN RIVER BASIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 7C.
W76-00094

EVALUATION OF A PROPOSED CONNECTOR WELL, NORTHEASTERN DESOTO COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
C. B. Hutchinson, and W. E. Wilson.
Available from National Technical Information Service, Springfield, Va 22161 as PB-237 633, $3.75 printed copy; $2.25 in microfiche. Water-Resources Investigations 5-74, July 1974. 41 p, 7 fig, 6 tab, 10 ref, 2 append.

Descriptors: *Artificial recharge, *Water conservation, *Evapotranspiration control, *Groundwater recharge, *Florida, Fruit crops, Citrus fruits, Model studies, Forecasting, Water storage, Aquifer characteristics, Hydraulic conductivity, Recharge wells, Water management(Applied).
Identifiers: *Connector wells, *Floridan Aquifer, Captured water.

At a 24,000 acre citrus grove in northeast DeSoto County, Florida, a connector well is proposed as a resource-management tool for capturing water normally lost through evapotranspiration and by excess runoff. Such a well would connect the surficial sand aquifer with the deep, highly transmissive limestone Floridan Aquifer. Because of natural head differences, water would move by gravity flow from the sand into the Floridan Aquifer, thus replenishing water withdrawn for irrigation from the Floridan Aquifer. A 70-acre marsh was selected as the test site based on analyses of hydraulic conductivity, porosity, and water quality. Recharge rate through the connector well under steady-state conditions is estimated at 160 gallons per minute. The proposed connector well is designed to have 10-inch screens opposite zones in the 45-foot thick sand aquifer, be cased for 400 feet opposite confining beds and a secondary limestone aquifer, and be open hole for about 250 feet in the Floridan Aquifer. A graded-sand filter pack placed around the screened sections of the well will increase its efficiency. (Woodard-USGS)
W76-00095

GROUND-WATER LEVELS IN THE UNITED STATES, 1968-72: NORTHEASTERN STATES.
Geological Survey, Reston Va.
For primary bibliographic entry see Field 7C.

LIBRARY U. OF I. URBANA

W76-00098

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ., Tucson. Div. of Economic and Business Research.
For primary bibliographic entry see Field 6B.
W76-00196

PILOT-SCALE, HIGH-RATE BIOLOGICAL DENITRIFICATION,
Ecolotrol, Inc., Bethpage, N.Y.
For primary bibliographic entry see Field 5D.
W76-00238

TOXIC HEAVY METALS IN GROUNDWATER OF A PORTION OF THE FRONT RANGE MINERAL BELT,
Colorado School of Mines, Golden. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-00274

AN ECONOMIC ANALYSIS OF THE PATTERNS AND TRENDS OF WATER CONSUMPTION WITHIN THE SERVICE AREAS OF THE HONOLULU BOARD OF WATER SUPPLY,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6D.
W76-00275

GROUND WATER CONTAMINATION IN INDIANA,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 5B.
W76-00276

BIBLIOGRAPHY OF AVAILABLE GROUNDWATER INFORMATION IN OREGON,
Oregon State Engineer's Office, Salem.
H. R. Sweet.
Groundwater Report No 20, October 1974. 26 p, 3 fig, 2 tab, 2 append.

Descriptors: *Groundwater, *Bibliographies, *Oregon, Observation wells, On-site investigations, State governments, *Groundwater resources, Data collections, Reviews, Information retrieval.

A bibliography of available information on groundwater in Oregon was compiled by the State Engineer's Office. The report listed 144 groundwater reports, and appendixes included lists of observation wells in the state, on-going groundwater investigations, and watermaster districts. (Robinson-ISWS)
W76-00289

SURVEY OF GROUND-WATER PROTECTION METHODS FOR ILLINOIS LANDFILLS,
Illinois Environmental Protection Agency, Springfield, Div. State of Land Pollution Control.
For primary bibliographic entry see Field 5B.
W76-00293

GROUND-WATER RECHARGE RATES FROM THERMOMETRY,
Agricultural Research Service, Fresno, Calif.
H. I. Nightingale.
Ground Water, Vol 13, No 4, p 340-344, July-August 1975. 5 fig, 4 tab, 12 ref.

Descriptors: *Groundwater, *Recharge, *Temperature, *Recharge ponds, *Water temperature, *California, Air temperature, Percolating water, Fourier analysis, Percolation, Seepage, Infiltration, Groundwater movement, *Artificial recharge, Statistics.
Identifiers: *Leaky Acres Recharge Project(Calif), *Flow velocities, *Falling head method, *Thermometry.

Basin artificial groundwater recharge rate at the Leaky Acres Recharge Project in Fresno, California, was evaluated by Fourier analysis of temperature variations of air, basin water, and groundwater. The weekly mean basin water temperature correlated well (r=0.982) with weekly mean air temperature. Weekly mean temperature data of the air, basin water, and recharged groundwater showed that the first harmonic curve was satisfactory for determining the times of minimum and maximum temperature when convective transfer of heat was considered. The lag time between maximum basin water temperature and maximum groundwater temperature at a 16 m depth, showed water moved at a thermal tracer velocity of 20.8 cm/day. The corresponding infiltration rate measured by the falling-head method in study area basins was 18.5 cm/day. This indicated that under suitable conditions with simple field instrumentation groundwater thermometry can be used to estimate the rate and direction of recharged water movement. (Prickett-ISWS)
W76-00294

UPCONING OF THE SALT-WATER--FRESH-WATER INTERFACE BENEATH A PUMPING WELL,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. L. Chandler, and D. B. McWhorter.
Ground Water, Vol 13, No 4, p 354-359, July-August 1975. 6 fig, 1 tab, 9 ref.

Descriptors: *Saline water-freshwater interfaces, *Water wells, *Penetration, Pumping, Saline water, Water table, Anisotropy, Isotropy, Optimization, Permeability, Entrainment, Dupuit-Forchheimer theory, Mathematical models, Model studies, Numerical analysis, Boundaries(Surfaces), Equations, Density, Pressure head, Discharge(Water).
Identifiers: *Upconing, *Partial penetration, Permeability ratio, Chyben-Herzberg approximation, Critical discharge, Transition zone, Iteration, Implicit numerical technique.

The upconing of saline water in response to pumping from an overlying layer of fresh water was investigated by numerical integration of the governing differential equation. The transition zone between the fresh and saline water was idealized as an abrupt interface. Full consideration of the nonlinear boundary conditions on the water table and interfacesurface was included for steady flow toward partially penetrating pumping wells in both isotropic and anisotropic aquifers. There exists an optimum well penetration into the fresh-water layer which permits maximum discharge without salt- water entrainment. The optimum penetration increases as the vertical permeability is reduced relative to the horizontal permeability. The maximum well discharge obtainable withour salt-water entrainment is greater for aquifers with a reduced vertical permeability than for isotropic aquifers, a result that contrasts with previously published conclusions. Previous analyses which linearize the boundary condition on the interface overestimated the critical discharge (Visocky-ISWS)
W76-00295

THE OCCURRENCE AND DEVELOPMENT OF GUEST SINK, HERNANDO COUNTY, FLORIDA,
Southwest Florida Water Management District, Brooksville.
B. A. Boatwright, and D. W. Allman.
Ground Water, Vol 13, No 4, p 372-375, July-August 1975. 4 fig, 2 ref.

Descriptors: *Sinks, *Collapse, *Karst, *Flori[da], Caves, Water table, Potentiometric level, Obs[er]vation wells, Land subsidence, Crat[ers], Geomorphology, Drainage, Swamps, Sprin[gs], Transmissivity, Carbonate rocks, Drilling, Sa[fety] value, Replacement costs, Saline water fr[om] water interfaces, Chlorides, Monitoring.
Identifiers: *Chassahowitzka Swamp(Fla), *Gu[lf] sink(Fla), *Floridan aquifer, Catastrophes, C[ol]ing, Satellite sinks.

The spectacular occurrence of a sinkhole near t[he] Gulf Coast of Florida engulfed a well drilling r[ig], water truck, and a load of PVC pipe on a trailer [in] within less than 10 minutes. The 150-foot diame[ter] sinkhole, which was initially dry and extended [to] depth of 59 feet below mean sea level, develo[ped] suddenly on September 19, 1974. This occur[red] during the drilling of a 6-inch well in Hernan[do] County, about 5 miles inland from the Gulf [of] Mexico at a land surface elevation of 11 feet ab[ove] mean sea level. The sinkhole, which displa[ced] 6500 cubic yards, began to develop when the [drill] bit entered a cavity at a depth of 202 feet. [Nu]merous satellite sinks ranging up to 20 fee[t] diameter occurred simultaneously with [the] development of the parent sink. Within 24 ho[urs] groundwater discharge into the parent sink fr[om] the shallow, unconfined and unconsolida[ted] aquifer had filled the sink to an elevation of 8 [ft] above mean sea level. The total estimated repla[ce]ment cost of the equipment lost in the sinkhol[e] $120,000. (Visocky-ISWS)
W76-00296

EFFECT OF CESSPOOL DISCHARGE [ON] GROUND-WATER QUALITY ON LO[NG] ISLAND, N.Y.,
Nassau County Health Dept. Mineola, N.Y. [En]vironmental Conservation Programs.
For primary bibliographic entry see Field 5B.
W76-00308

GROUNDWATER CONDITIONS IN THE P[E]RITH SANDSTONE AT CLIBURN, WESTM[OR]LAND,
Institute of Geological Sciences, Lon[don] (England). Dept. of Hydrological.
P. E. R. Lovelock, M. Price, and T. K. Tate.
Journal of the Institution of Water Engineers [and] Scientists, Vol 29, No 4, p 157-173, June 197[5]. fig, 1 tab, 1 plate, 19 ref.

Descriptors: *Groundwater availability, *On[-s]ite investigations, *Laboratory tests, Core drill[ing], Aquifer characteristics, Transmissivity, W[ater] table aquifers, Storage coefficient, Specific y[ield], Sandstones, Fissures(Geologic), Fracture perm[e]bility, Groundwater movement, Geologic cont[rol], Groundwater resources, Observation w[ells], Borehole geophysics, Peameability, Poro[sity], Capillary action, Pumping, Percolation.
Identifiers: *England, *Gravity drainage.

Using a combination of field and labora[tory] techniques, the formation constants and bou[nd]aries of a fissured aquifer (the Penrith Sandst[one] have been determined at Cliburn, Westmorel[and]. Groundwater movement appears to take p[lace] primarily along horizontal fissures which are [well] developed near the water table. Initial respon[se] pumping is that of a fissured, unconfined aqu[ifer] with subsequent gravity drainage occurring w[hen] drawdown is sufficient to overcome the capi[llary] suction of a cemented unit just above the w[ater] table. Two barrier boundaries, presumed t[o be] faults, further complicate the analysis. Trans[mis]sivity is unusually high, and the aquifer appea[rs to] have considerable potential for a water su[pply]. Further study is necessary, however, on th[e re]gional water balance and on the vertical and la[teral] variations of transmissivity and storage co[effi]cient. (Visocky-ISWS)
W76-00309

RADIOCARBON AGES OF GROUND WATER AS A BASIS FOR THE DETERMINATION OF SAFE LIMITS OF AQUIFER EXPLOITATION,
Nova Univ., Fort Lauderdale, Fla. Life Science Center.
For primary bibliographic entry see Field 5B.
W76-00363

ARE DRILLERS LEGALLY RESPONSIBLE FOR GROUND WATER POLLUTION,
For primary bibliographic entry see Field 5G.
W76-00386

DESIGN AND FABRICATION OF A BORE-HOLE LOGGING DEVICE FOR USE IN GROUND WATER OPERATIONS,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
K. V. G. K. Gokhale.
In: International Symposium on Development of Ground Water, November 26-29, 1973, Madras, India, Vol 1, pIb 27-Ib31, 4 fig, 5 ref.

Descriptors: *Thermal stratification, *Logging(Recording), Well data, Locating, Borehole methods, Subsurface, Aquifers, Geophysics.
Identifiers: *Temperature logging, Hydro-geologic parameters.

A temperature logging unit for use in bore holes in ground water investigations was designed and fabricated. The temperature is determined by the variation in resistance of the circuit in the device. The circut diagram and the details of operation for this instrument are provided. A temperature log from a known borehole is presented. The device shows a constant temperature below the water table except in the area of sand aquifers where there is a slight decrease in temperature. The profile is thus in close correlation with the lithologic log of the hole. (Bradbeer-NWWA)
W76-00397

ELECTROMAGNETIC DEPTH SOUNDING FOR GROUND WATER EXPLORATION IN RESISTIVE FORMATIONS,
Indian Inst. of Tech., Kharagpur. Dept. of Geology and Geophysics.
H. P. Patra, and N. Sanyal.
In: International Symposium on Development of Ground Water, November 26-29, 1973, Madras, India, Vol 1, p Ib-I-9, 6 fig, 8 ref.

Descriptors: *Exploration, *Electromagnetics, *Remote sensing, *Surbsurface, *Conductivity, Locating, Surveys, Evaluation, Geophysics, Sounding.
Identifiers: *Electromagnetic depth sounding, *Resistive formations, *Groundwater exploration.

Failure of conventional direct current resistivity sounding in solving the problems of exploration of ground water resources in highly resistive formations, that is, in crystalline rocks and in loose, dry sands where a high contact resistivity almost stops direct current flow, makes multifrequency electromagnetic depth soudning techniques necessary. Dipole Frequency Sounding (DFS) is the method where the source is a horizontal, small, current-carrying dipole and the vertical component of the magentic field is measured at a fixed distance from the source by means of a pickup coil. Another method of sounding uses a comparatively larger loop and involves the measurement of the vertical component of the magentic field induced at the center of a circular or square loop. This is the Central Frequency Sounding (CFS) method. These two methods are compared in efficiency, depth of investigation and optimum frequency range. The applicability of the methods is demonstrated. A few representative master curves are reproduced and interpretation of field curves is discussed. (Bradbeer-NWWA)
W76-00398

THEORY AND APPLICATION OF THE SKIN EFFECT CONCEPT TO GROUND WATER WELLS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-00399

PARTIALLY PENETRATING WELL IN A CONFINED AQUIFER,
Osmania Univ., Warangal (India). Regional Engineering Coll.
For primary bibliographic entry see Field 8B.
W76-00400

STUDIES ON A WELL PENETRATING A TWO-AQUIFER SYSTEM,
Indian Inst. of Tech. Madras.
For primary bibliographic entry see Field 8B.
W76-00401

A MATHEMATICAL APPROACH TO SOME ASPECTS OF GROUND WATER FLOW IN HARD ROCK AREAS,
Ground Water Inst., Poona (India).
D. G. Limaye, and S. D. Limaye.
In: International Symposium on Development of Ground Water Resources, November 26-29, 1973, Madras, India, Vol 2, p III-95-III-103, 5 fig, 2 ref.

Descriptors: *Base flow, *Aquifers, *Flow characteristics, *Flow rates, *Fluid movement, Wells, Dug wells, Water supply, Fracture permeability, Hydrology, *Groundwater movement, Mathematical models, Seasonal.
Identifiers: *Hard rock aquifers, Directional flow, India.

Field conditions in hard rock areas ofter deviate too far from those assumed for developing standard mathematical equations dealing with ground water flow towards wells in non-hard rock areas. Large drawdowns, limited aquifer dimensions, low permeabilities, large seasonal variations in well yield, non-radial flow and flow affected by structure are some of the peculiarities of hard rock areas in Central and Southern India. A basic approach towards formulation of a separate mathematical treatment for dug wells in hard rock areas is given on the basis of parallel flow lines. A basic equation of such flow is developed and its application to infiltration wells or galleries, and dug wells is shown. (Bradbeer-NWWA)
W76-00402

SEEPAGE IN WELL SYSTEMS NEAR A BARRIER BOUNDARY,
Osmania Univ., Hyderabad (India).
For primary bibliographic entry see Field 8B.
W76-00403

HYDRAULICS OF SHALLOW WELLS IN HARD ROCKS,
Kaunasskii Politekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 8B.
W76-00404

SKIMMING OF FRESH WATER AFLOAT UPON SALT WATER,
Pant Univ. of Agriculture and Technology, Pantnagar, Govind Ballabh (India).
B. M. Shani.
In: International Symposium on Development of Ground Water Resources, November 26-29, 1973, Madras, India, Vol 2, p IV-31-IV-42. 5 fig, 4 ref.

Descriptors: *Skimming, *Salt water aquifers, Saline water, Wells, Boreholes, Groundwater, Mathematical models, Computer models, Drawdown, Optimization, Saline water intrusion.
Identifiers: *Non-penetrating wells, *Skimming wells.

In many coastal areas as well as some inland aquifers fresh water is underlain by saline water. In such areas when fresh water is skimmed using a partially penetrating well, the reduced head towards the well causes an up coning of the fresh water-saline water interface beneath the well. In order to predict the maximum uncontaminated fresh water discharge, it is necessary to know the hydrodynamics of the up coning of the brine in response to pumping. Theoretical analysis as well as laboratory model studies were made to study this phenomenon. A mathematical model using, finite difference iterative technique is presented and developed for evaluating the performance of skimming wells under a wide range of field conditions. Practical utility of the results in deciding the optimum fresh water production from skimming wells is discussed. (Bradbeer-NWWA)
W76-00405

PROCEDURES AND EQUIPMENT FOR PUMPING AND FREEFLOWING TESTS OF WATER WELLS,
Geological Survey of Australia, Melbourne. Mines Dept.
For primary bibliographic entry see Field 8C.
W76-00406

BACTERICIDES USED IN DRILLING AND COMPLETION OPERATIONS,
Petrolite Corp., Tretolite Div. St. Louis, Mo.
For primary bibliographic entry see Field 5C.
W76-00409

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
For primary bibliographic entry see Field 5B.
W76-00410

GEOLOGICAL SOCIETY ENGINEERING GROUP WORKING PARTY REPORT ON THE LOGGING OF ROCK CORES FOR ENGINEERING PURPOSES.
Geological Society of London (England).
For primary bibliographic entry see Field 8G.
W76-00412

SOME HYDROGEOPHYSICAL PROPERTIES OF THE BUNTER SANDSTONE OF NORTHWEST ENGLAND,
Birmingham Univ. (England).
For primary bibliographic entry see Field 2F.
W76-00413

GROUND WATER CONDITIONS IN GREATER TEHRAN,
Imperial Coll. of Science and Technology, London (England).
J. L. Knill, and K. S. Jones.
Quarterly Journal of Engineering Geology, Vol 1, No 3, p 181-194, December, 1968. 6 fig, 1 plate, 5 ref.

Descriptors: *Alluvial aquifers, *Alluvium, *Recharge, *Groundwater, *Aquifer characteristics, Aquifer system, Hydrogeology, Water sources, Subsurface waters, Discharge, Water supply.
Identifiers: *Tehran, *Iran.

Tehran is situated on an alluvial plain immediately south of the Alborz Mountains which form an east-west chain stretching across northern Iran. The alluvium is composed of an older, folded group of probable Pliocene age, which is overlain by flat- lying Quaternary gravels, sands, silts, and boulder beds. Recharge from surface streams takes place in the areas underlain by the flat-lying alluvium. The pattern of ground water flow is related to the sub-surface structure of the alluvium. Chemical data are presented which indicate that

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extensive surface recharge takes place below the city. The ground water balance is discussed and it is concluded that, at present, there is a balance between inflow and extraction. (Bradbeer-NWWA)
W76-00414

THE HYDROGEOLOGICAL INVESTIGATION OF FISSURE-FLOW BY BOREHOLE LOGGING TECHNIQUES,
Geological Sciences Inst., London (England).
For primary bibliographic entry see Field 8G.
W76-00417

MANAGEMENT OF UNDERGROUND WATER RESOURCES,
University Coll., London (England).
For primary bibliographic entry see Field 3B.
W76-00418

THE USE OF RESISTIVITY LOGGING TO ESTIMATE BOREHOLE YIELD FROM A MATRIX-CONDUCTING SANDSTONE,
Birmingham Univ. (England).
P. F. Worthington.
Quarterly Journal of Engineering Geology, Vol 4, No 4, p 263-279, October, 1972. 7 fig, 1 tab, 15 ref.

Descriptors: *Water yield, *Water wells, *Boreholes, *Resistivity, Electrical well logging, *Sandstone, Formation factor, Hydraulic conductivity, Yield equations, Logging(Recording).
Identifiers: *Resistivity logging, *Matrix conduction.

Borehole resistivity methods have been used to study the Bunter Sandstone aquifer (Permo-Triassic) of north-west Lancashire, England. The results of water resistivity and normal logging surveys are discussed. Using the determined distribution of ground water resistivity an average formation factor is calculated for each well. This quantity is shown to be affected by conduction of the sandstone matrix, a phenomenon which is used to estimate hydraulic conductivity at borehole sites as follows. Within a limited section of the aquifer, values of hydraulic conductivity calculated from pump test data are correlated with formation factors corrected for several assumed levels of matrix conduction. The most significant correlation furnishes an empirical relationship which permits the interpolation of hydraulic conductivity in terms of the resistivity data. Estimated values of hydraulic conductivity at the sites of unlogged wells are generally at least as accurate as those obtained directly from interpolated hydrological parameters. The possible extension of the method to predict potential well yields is briefly indicated. (Bradbeer-NWWA)
W76-00419

PLANNING A MUST FOR GROUNDWATER DEVELOPMENT,
Baffa (John J.), Fort Lee, N.J.
J. J. Baffa.
Water and Wastes Engineering, Vol 12, No 2, p 44-50, February 1974. 3 fig.

Descriptors: *Water resources, *Planning, *Project planning, *Water management(Applied), Regional development, Ground water, Environmental effect.
Identifiers: *Environmental impact, *Groundwater development, Urban planning.

Design involves the provision of adequate quantity and quality for intended uses. Quantity available is related to aquifer extent, natural recharge characteristics, artificial recharge possibilities, drought occurrence and the properties of the aquifer which affect the extractability of the water in storage such as field permeability, transmissability and coefficient of storage. Quality is related to the naturally occurring relationships of solubility and ion exchange of soil rock. Additionally, the recognition of various environmental impacts must be considered in the design of groundwater supplies and management of groundwater basins. Situations where no data exists as to geology or hydrology require the use of geophysical methods or bore holes or both to permit geological and hydrological mapping. Surface characteristics of the recharge area should be examined for the use of the land in this area affects the quality of the water running over it, or infiltrating it, and subsequently percolating through it. Some of the available tools have been boreholes for regional and local correlations, test wells for estimates of performance and quality, and pumping testing of individual wells and groups of wells to determine aquifer transmissability and storage characteristics. (Bradbeer-NWWA)
W76-00422

FIELD RESULTS: NOISE-LOGGING TECHNIQUE,
McCullough Services, Houston, Tex. Research and Development.
For primary bibliographic entry see Field 8G.
W76-00423

THE EFFECT OF GEOLOGICAL FEATURES ON THE OCCURRENCE OF GAS OUTBURST FRACTURES IN THE EAST MIDLAND COALFIELD,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 8E.
W76-00424

SEALING OF ANAEROBIC DAIRY WASTE LAGOONS IN SANDY, HIGH WATER TABLE SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-00445

SOME IN-SITU PERMEABILITY TESTS IN SANDS,
Halcrow (William) and Partners, London (England).
For primary bibliographic entry see Field 8B.
W76-00484

STUDIES OF SPECIFIC CAPACITIES OF WELLS IN HARD ROCKS AND ALLUVIAL FORMATIONS OF MYSORE STATE,
Central Ground Water Board, Bangalore (India).
K. V. J. R. Krupanidhi, S. Venkataraman, D. P. Mathuria, and K. N. Murthy.
In: International Symposium on Development of Ground Water, November 26-29, 1973, Madras, India, Vol 1 pIIa 61-IIa74, 7 fig, 6 ref.

Descriptors: *Specific capacity, *Discharge(Water), *Groundwater, *Pumping, *Alluvial aquifers, Dug wells, Boreholes, Pump tests, Performance, Water wells.
Identifiers: *Hard rock aquifers, Mysore, *India.

Data of pump tests carried out on almost 50 dug wells tapping (1) hard rocks comprising schists, phyllites, granites, gneisses, metavolcanics, quartzites and (2) alluvial fills made up of coarse granular materials were analysed to determine specific capacities by using Slichter's formula. The dug wells ranged in cross-sectional area from 3.6 to 119 square meters, the alluvial wells being smaller with cross-sectional area varying from 3.6 to 29.2 square meters. The specific capacities of hard rock wells ranged from 1.26 liters per minute in massive metavolcanics to 187.5 lpm/m in weathered gneiss and from 59 lpm/m to 874 lpm/m in alluvium. Graphical representation of specific capacities against cross-sectional areas shows that wells in hard rocks and alluvium fall in distinct and identifiable fields. The specific capacities of wells located in hard rocks are, however, less due to the smaller cross-sectional areas yield of bore wells in hard rocks has also analysed. (Bradbeer-NWWA)
W76-00485

THE FIRST HYDROLOGICAL APPLICATION OF A SPACE PHOTOGRAPH, TAMIL NADU, INDIA, 1967,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 7B.
W76-00486

SALINE GROUND WATERS IN THE CARBONIFEROUS ROCKS OF THE ENGLISH MIDLANDS IN RELATION TO THE GEOLOGY,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 2F.
W76-00488

SCREEN THEORY FOR WELLS AND DRAINPIPES,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 8B.
W76-00490

4C. Effects On Water Of Man's Non-Water Activities

ANALYSIS OF FLOW THROUGH VEGETATION,
Florida Univ., Gainesville. Dept. of Civil Coastal Engineering.
For primary bibliographic entry see Field 4A.
W76-00015

NON-CONSERVATION IN ARIZONA: ESTIMATES OF SOME COSTS,
Arizona State Univ., Tempe.
R. J. Becker.
Journal of the Arizona Academy of Science 10, No 2, p 90-97, June, 1975. 45 ref.

Descriptors: *Conservation, *Ground resources, *Ecology, *Estimated costs, * use, Land resources, Land management, conservation, Soil conservation, N resources, Water resources, Water poll Water supply, Air pollution, Environment fects, Costs, Social values, Erosion, aspects, Economics, Urbanization.
Identifiers: Environmental damage.

Damage caused by man in Arizona to land, and air is discussed and cost estimates losses are made. Land is damaged by erosion the plant cover is destroyed. Land improve for farming are lost by city growth and by d ing water tables. Water is lost when the hydr cycle is disrupted and less rain falls; when gr water is pumped out and not allowed to rec when formerly dry areas are filled with wat when wet areas are drained. Air is lost wh carrying capacity for wastes has been exce as it has in many parts of Arizona. (Rob Arizona)
W76-00191

GROUND WATER CONDITIONS IN GRE TEHRAN,
Imperial Coll. of Science and Technology, L (England).
For primary bibliographic entry see Field 4B
W76-00414

4D. Watershed Protection

THE DEPOSITIONAL ENVIRONMENT OF ZINC, LEAD AND CADMIUM IN RESERVOIR SEDIMENTS,
Tulsa Univ., Okla. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W76-00292

THE MEASUREMENT OF HEAVY RAINFALL OVER SMALL CATCHMENTS USING RADAR,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W76-00300

SOME SMALL-SCALE CHARACTERISTICS OF EXTREME STORM RAINFALLS IN SMALL BASINS,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 2B.
W76-00301

PRECIPITATION CONDITIONS RESULTING IN FLASH FLOODS AS RELATED TO THE FREQUENCY DISTRIBUTION OF INTERDIURNAL VARIATIONS OF THE SPECIFIC RUNOFF IN MINOR CATCHMENT AREAS UNAFFECTED BY MAN,
Meteorologischer Dienst der Deutschen Demokratischen Republik, Potsdam.
For primary bibliographic entry see Field 2E.
W76-00302

PCB'S IN SUBURBAN WATERSHED, RESTON, VA.,
Federal Energy Administration, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00319

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

NITRATE DETERMINATION WITH INDIGO CARMINE,
Water Management Board, Brno (Czechoslovakia).
J. Maly, and H. Fadrus.
Jounral of the American Water Works Association, Vol 67, No 7, p 395-397, July 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Nitrates, *Analytical techniques, *Nitrogen compounds, *Photometry, *Indicators, Chemical analysis, Colorimetry, Analysis, Spectrophotometry, Chemistry, Color reactions, Evaluation, Instrumentation, Testing, Nitrites, Testing procedures, Chlorides, Sulfates, Ions, *Pollutant identification.
Identifiers: *Indigo carmine, Indigo, Redox indicator, Blue color, Ferrous ion, Oxidizing reaction, Pulfrich photometer, Water bath.

The experimental conditions necessary for the successful photometric determination of nitrate using indigo carmine were given. Using the proposed method, researchers observed no interference in the presence of sulfate, chloride, phosphate, ammonium, sodium, potassium, calcium, or magnesium up to 1000 mg/1. Ferrous and nitrate ions interference may be eliminated by oxidation. (Henley-ISWS)
W76-00021

VALIDITY OF SOIL-WATER SAMPLES COLLECTED WITH POROUS CERAMIC CUPS,
Forest Service (USDA) Cadillac, Mich. North Central Forest Experiment Station.
E. A. Hansen, and A. R. Harris.
Soil Science Society of America Proceedings, Vol 39, No 3, p 528-536, May-June 1975. 9 fig, 2 tab, 8 ref.

Descriptors: *Equipment, *Sampling, *Soil water, Pollutants, Nutrients, Phosphorus, Nitrates, Laboratory tests, On-site investigations, Water pollution, Soil contamination, Soil filters, *Pollutant identification, Water quality.
Identifiers: *Suction lysimeter, Soil water samples, Porous cups, Unsaturated zone.

Laboratory and field tests were made to determine if porous ceramic cups collect representative samples of nitrate and phosphate from soil water. Substantial bias and variability were found. Some of the sources of sample bias were soroption, leaching, diffusion, and screening of phosphate ions by the cup walls. Sample variability of nitrate ions was strongly influenced by sampler intake rate, plugging, sampler depth, and type of vacuum system (which simulated different sampler sizes). These factors affect timing of sample collection and, because nutrient concentration in soil water is continually changing, they in turn affect sample concentration. These factors produced as much as a 60% range in sample concentration from 8 samplers installed in a small uniform plot. Added to this variability is an unknown amount of bias representing the difference between the sample concentration and the average drainable soil-water concentration. The many factors affecting the sample concentration together with the demonstrated variability and unknown bias make interpretation of sampler data difficult. To reduce sample variability, samplers should be grouped by intake rate. Short sampling intervals, uniform sampler lengths, and the same initial vacuum should be used for all samplers. (Sims-ISWS)
W76-00024

CHEMICAL QUALITY OF WATER IN CONSERVATION AREA 2A AND ASSOCIATED CANALS,
Cental and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
P. J. Gleason.
Technical Publication No 74-1, February 1974. 147 p, 17 fig, 21 tab, 13 ref, 2 append.

Descriptors: *Water quality, *Chemical analysis, *Wildlife conservation, *Evaluation, *Water analysis, *Florida, Analytical techniques, Chemistry, Instrumentation, Canals, Surface drainage, Nutrients, Nitrates, Phosphates, Marshes, Surface waters, Testing, Water chemistry, Drawdown, Specific conductivity, Mineralogy.
Identifiers: Hillsboro Canal, North New River Canal, *Everglades Park, Supply canals.

During the period October 1972 to August 1973, a detailed examination of surface water quality within Conservation Area 2A and associated canals in southern Florida was carried out. The chemical quality of the Hillsboro Canal and the North New River Canal waters was not significantly different from the 1940's. It was found that the Everglades marsh had a purifying effect on the agricultural drainage discharged over the area. Nutrients decreased to levels below detection limits and alkalinity showed a slight reduction. The marsh exhibited no effect on chloride, sodium, and silica concentrations. Drawdown of the area between February and July 1973 had no determinable effect on the chemical composition of the water refilling the marsh. Tabulated results of the chemical analyses of samples collected in the area were presented. (Henley-ISWS)
W76-00033

ENVIRONMENTAL MONITORING: A NEW REQUIREMENT FOR THE MINING INDUSTRY,
D. Lush, and K. Schiefer.
Canadian Mining Journal, Vol 96, No 5, May 1975, p 52-54, 72. 3 fig, 2 ref.

Descriptors: *Mining, Surface water, Temperature, Biochemical oxygen demand, Conductivity, *Sampling, *Groundwater, Heavy metals, Hydrogen ion concentration, Canada, Toxicity, Plankton.
Identifiers: Mill liquid effluent, Substrate clogging, *Pollution control.

While the results of these investigations had indicated the tailings effluent contained some environmentally undesirable components, their low concentrations were demonstrated to be non-toxic to fish. In the lengthy litigation that followed, certain facts came to light. A detailed scientific investigation of the area found the cause for declining fish stocks was threefold: (1) siltation of riffle areas resulted in reduction of critical spawning habitat; (2) the accumulation of several chemical elements in the sediments to levels that were toxic to small insects which formed the food base for fish populations; and (3) the long-term, sublethal effect of a floatation agent used in ore processing had inhibited normal reproductive cycles in several fish species. The result was a gradual decline in fish stocks over the years, instead of a direct and obvious fish kill, but the end result was the same. Through chemical, toxicological and biological monitoring an overall evaluation of the environmental effects of waste water discharged from mine or ore processing sites can be obtained. (Campbell-NWWA)
W76-00037

DEVELOPMENT OF IMPROVED PROCEDURES FOR MEASUREMENT OF MILL EFFLUENT AND RECEIVING WATER COLOR,
National Council for Air and Stream Improvement, Gainesville, Fla. Southern Research Center.
W. L. Carpenter, and H. F. Berger.
In: Proceedings of the 28th Industrial Waste Conference, Purdue University, May 1-3, 1973, p 234-251. 4 fig, 29 ref, 9 tab.

Descriptors: *Pulp wastes, *Natural streams, *Color, *Colorimetry, Spectrophotometry, Analytical techniques, Water pollution sources, Wastes, Industrial wastes, Water analysis, Water pollution effects, Water properties, Physical properties, *Pollutant identification.

This report summarizes the findings of a series of investigations on the measurement of effluent and receiving water color. The investigations reported cover several specific subjects, including an interlaboratory comparison of color measurement procedures, a study of sample clarification procedures, and an evaluation on turbidity and color removal effect during clarification of receiving water samples low in color yet high in turbidity. The interlaboratory comparison concluded that spectrophotometric procedures were best suited for both mill effluent and receiving water color measurements. It established further that comparable color measurements could be obtained between laboratories, provide that certain precautions were taken, such as control of sample pH and clarity, use of optically matched absorption cells, and reliable color calibration standards. Filtration through a 0.8-micrometer porosity membrane filter produced sample clarification equivalent to that accomplished by centrifugation or diatomaceous earth filtration, without removing any significant amount of true color. The effect of light path length on measured color is considered. Finally, a spectrophotometric procedure is proposed for routine measurement of true color in pulp and paper mill effluents and receiving waters. (Witt-IPC)
W76-00040

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COLOR OF PULP MILL EFFLUENTS.
Canadian Pulp and Paper Association, Technical Section, Standard H.5P, 3 p, September, 1974. 4 ref.

Descriptors: *Pulp wastes, *Color, *Water analysis, Spectrophotometry, Water pollution sources, Wastes, Industrial wastes, Analytical techniques, Colorimetry, Water properties, Physical properties, *Pollutant identification.

The Canadian standard method of measuring color can be applied to kraft and sulfite pulp mill effluents, provided their hues closely match the hue of a standard platinum- cobalt solution. Highly colored effluents are diluted volumetrically to bring their color into the range of the method. The effluent or diluted effluent is then adjusted to pH 7.6, prefiltered through a fiberglass paper, and filtered through a membrane filter having a nominal pore size of 0.8 micrometer. The pH is then readjusted to 7.6, if necessary, and the absorbance is measured in a spectrophotometer at a wavelength of 465 nm. The measured absorbance is then related to the absorbance of the platinum- cobalt standard solution at the same wavelength. (Witt-IPC)
W76-00050

POLAROGRAPHIC DETERMINATION OF DIMETHYL DISULFIDE AND METHYL MERCAPTAN IN AQUEOUS SOLUTIONS CONTAINING BOTH (OPREDELENIE METILMERKAPTANA I DIMETILDISUL'FIDA V VODNYKH RASTVORAKH PRI IKH SOVMESTNOM PRISTUSTVII POLYAROGRAFICHESKIM METODOM),
Arkhangelskii Lesotekhnicheskii Institut (USSR).
O. F. Gorbunova, and B. D. Bogomolov.
Izvestiya V.U.Z., Lesnoi Zhurnal, Vol 18, No 1, p 135-139, 1975. 2 fig, 5 ref, 1 tab.

Descriptors: *Pollutant identification, *Polarographic analysis, *Pulp wastes, *Sulfur compounds, Water pollution sources, Wastes, Analytical techniques, Industrial wastes, Organic compounds, Chemical analysis, Effluents.
Identifiers: *Dimethyl disulfide, *Methyl mercaptan, *Kraft mills.

The method described, which is suitable for the determination of the two sulfur compounds in kraft mill effluents, is based on the specific reaction of methyl mercuric iodide with thiol groups, which gives a reproducible polarographic wave at -0.55 to -0.6 volts. The electrolyte solution used has a pH of 9 and contains ammonia, ammonium chloride, pottassium chloride, and sodium sulfite. The last compound converts dimethyl disulfide into thiol compounds, and the result gives the total content of methyl mercaptan plus dimethyl disulfide. In a second sample, methyl mercaptan is oxidized with iodine in an acidic medium, the excess iodine is removed with sodium sulfite, and the polarographic determination is conducted as above. This gives one-half the amount of mercaptan and the total amount of disulfide. The amount of mercaptan is calculated as the double difference between the result of the first and second determinations. The amound of dimethyl disulfide is given as the difference between the total sulfur compounds and the amount of mercaptan. Results of analyses of a laboratory-prepared mixture of the two sulfur compounds are tabulated. (Stapinski-IPC)
W76-00054

ORGANIC COMPOUNDS FROM KRAFT PULPING EFFLUENTS. III. PHENOLS (ORGANICHESKIE VESHCHESTVA STOCHNYKH VOD SUL'FATNOTSELLYULOZNOGO PROIZVODSTVA. III. FENOLY),
Vaesyuznyi-Nauchnyi Planovii Ozdel Tsellyulozno-Bumazhnoi Promyshlennost, Leningrad (USSR); and Leningradskii Lesotekhnicheskii Akademiya (USSR).
Yu. I. Chernousov, N. A. Ivanov, and V. N. Piyalkin.
Kimiya Drevesiny, No 2, p 105-111, March/April, 1975. 2 fig, 3 ref, 4 tab.

Descriptors: *Pulp wastes, *Phenols, *Water pollution sources, Gas chromatography, Organic compounds, Analytical techniques, Wastes, Industrial wastes, *Pollutant identification, Separation techniques, Aromatic compounds, Chemicals, Pulp and paper industry, Foreign countries, Water analysis.
Identifiers: Black liquor, Guaiacol, Baikal pulp mill(USSR), Lake Baikal(USSR), Kraft mill.

Block diagrams are given of two schemes for the separation of phenols from kraft black liquors of the Baikal pulp mill. The organic compounds in black liquor contain up to 5% phenols, including 15 different phenolic compounds. The principal phenol in the mixture was guaiacol (55-60%). The amount of phenol, itself, in the black liquor did not exceed 0.5%. A temperature-programmed gas-liquid chromatographic method was developed for the quantitative and qualitative analysis of total phenols. The analysis of monohydric phenols has a precision of 7%, while that of polyhydric phenols is 17%. The phenolic compositions of effluents from soda pulping and the evaporators are identical to that of black liquor. The principal source of pollution of mill effluents with phenols are the condensates of the black liquor evaporators and the pulping units. About 93% of the phenols are removed from pulp mill effluents. There was no phenol in the effluents being discharged into Lake Baikal. (Chern-IPC)
W76-00055

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1972-73 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-00086

THE DETERMINATION OF SPECIFIC FORMS OF ALUMINUM IN NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
R. B. Barnes.
Chemical Geology, Vol 15, p 177-191, 1975. 3 tab, 18 ref.

Descriptors: *Chemical analysis, *Aluminum, *Groundwater, *Testing procedures, Sampling, Chemical reactions, Ionization, Colloids, Suspended solids, Thermal springs, Oil wells, Filtration, Separation techniques, Methodology, *Pollutant identification.
Identifiers: Natural groundwaters.

A Procedure for analysis and pretreatment of natural-water samples to determine very low concentrations of Al is described which distinguishes the rapidly reacting equilibrium species from the metastable or slowly reacting macro ions and colloidal suspended material. Aluminum is complexed with 8-hydroxyquinoline (Oxine), pH is adjusted to 8.3 to minimize interferences, and the aluminum oxinate is extracted with methyl isobutyl ketone (MIBK) prior to analysis by atomic absorption. To determine equilibrium species only, the contact time between sample and 8-hydroxyquinoline is minimized. The Al may be extracted at the sample site with a minimum of equipment and the MIBK extract stored for several weeks prior to atomic absorption analysis. Data obtained from analyses of 39 natural groundwater samples indicate that filtration through a 0.1 micrometer pore size filter is not an adequate means of removing all insoluble and metastable Al species present, and extraction of Al immediately after collection is necessary if only dissolved and readily reactive species are to be determined. An average of 63% of the Al present in natural waters that had been filtered through 0.1 micrometer pore size filters was in the form of monomeric ions. The total Al concentration, which includes all forms that passed through a 0.1 micrometer pore size filter, ranged 2-70 micrograms/liter. The concentration of Al in the form of monomeric ions ranged from below detection to 57 micrograms/liter. Most of the natural water samples were collected from thermal springs and oil wells. (Woodard-USGS)
W76-00091

GEOLOGIC MAP SHOWING SPRINGS RICH IN CARBON DIOXIDE OR CHLORIDE IN CALIFORNIA,
Geological Survey, Menol Park, Calif.
For primary bibliographic entry see Field 7C.
W76-00092

INDEX TO U. S. GEOLOGICAL SURVEY COMPUTER FILES CONTAINING DAILY VALUE FOR WATER PARAMETERS TO SEPTEMBER 30, 1971, NORTHEASTERN REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00097

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PARTS 9 AND 10 COLORADO RIVER BASIN AND THE GREAT BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00099

CHEMISTRY OF WATER SUPPLY, TREATMENT, AND DISTRIBUTION,
Ohio State Univ., Columbus. Water Resource Center.
For primary bibliographic entry see Field 5F.
W76-00102

NUTRIENT INPUTS TO A LAKE AND THEIR EFFECTS UPON WATER QUALITY,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5C.
W76-00104

APPLICATION OF GAS CHROMATOGRAPHY OF VOLATILE METAL CHELATES TO WATER ANALYSIS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. A. Minear, and C. M. Palesh.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 39-61. 8 fig, 43 ref, 7 tab.

Descriptors: *Water analysis, *Gas chromatography, *Metals, Analytical techniques, Copper, Aluminum, Chromium, Beryllium, Iron, Lead, Nickel, Zinc, Water pollution sources, Water chemistry, Chromatography, Chelation, *Pollutant identification.

The use of trifluoroacetylacetone for the analysis of Cu, Al, Cr, and Be has been demonstrated with respect to natural water analysis. Gas chromatographic analyses were conducted with a Varian Aerograph model 1740 gas chromatograph equipped with either a flame ionization detector or a tritium electron capture detector. Of several columns evaluated, 5% QF-1 on Varaport 30, and 15% Carbowax 20M on Chromosorb W provided separations that allowed determination of Cu, Cr, and Al but not Fe. The Carbowax 20M column provided excellent resolution of Cu from Cr but not Fe, Al, and Cu from one another. Al, Cu, and Cr were separated on QF-1. Preliminary studies with 2,2,6,6-tetramethylheptane-3,5-dione (dipivaloylmethane) involving Pb, Ni, Cu, and Cr showed promise only for Pb. (See also W76-00105) (Witt-ICP)
W76-00105

NEW ANALYTICAL TECHNIQUES FOR THE STUDY OF WATER DISINFECTION,
Alabama Univ., University. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5F.
W76-00106

EQUILIBRIA IN AQUEOUS SOLUTIONS OF CHLORINATED ISOCYANURATE,
Lawrence Experiment Station, Mass.
For primary bibliographic entry see Field 5F.
W76-00116

THE EFFECT OF WATER TREATMENT AND DISTRIBUTION ON TRACE ELEMENT CONCENTRATIONS,
Pittsburgh Univ., Pa. Graduate School of Public Health.
For primary bibliographic entry see Field 5F.
W76-00120

OIL POLLUTION STUDIES ON LAKE MARACAIBO, VENEZUELA,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
W. L. Templeton, E. A. Sutton, R. M. Bean, R. C. Arnett, and J. W. Blaylock.
In: 1975 Conference on Prevention and Control of Oil Pollution; Proceedings, p 489-496, March 1975. 3 fig, 1 tab, 14 ref.

Descriptors: *Lakes, *Oil pollution, Limnology, Water quality, Environmental effects, Toxicity, Organic compounds, Primary productivity, Sediments, Fauna, Wastes, Bioassay, Fisheries, Biodegradation, Sedimentation, Water pollution effects, Pollutant identification.
Identifiers: *Lake Maracaibo(Venezuela), Volatilization.

The results of a 2-year study on the impact of oil discharges, domestic wastes, and industrial pollution on Lake Maracaibo, Venezuela, were discussed. Analyses of environmental samples-water, sediments, and biota showed low concentrations of oil in lake water an no detectable accumulation of petroleum-derived hydrocarbons in muscle tissue of selected commercial species. The occurrence of bituminous materials in the sediments suggested that the natural processes of volatilization, biodegradation and sedimentation were the major mechanisms for the removal of oil from the surface waters. The lake system was described with relevant water quality, hydrographic, ecological, and fishery resources data. (Katz)
W76-00140

CHEVRON MAIN PASS BLOCK 41 OIL SPILL: CHEMICAL AND BIOLOGICAL INVESTIGATIONS,
Chevron Oil Field Research Co., La Habra, Calif.
J. D. McAuliffe, A. E. Smalley, R. D. Groover, J. M. Welsh, and W. S. Pickle.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 555-566, March 1975. 3 fig, 11 tab, 16 ref.

Descriptors: *Oil spills, *Oil pollution, *Sampling, Bioassay, Environmental effects, Benthic flora, Benthic fauna, Shellfish, Fish, Water quality, Dispersants, Population, Toxicity, Speciation, Water pollution effects, Path of pollutants, Louisiana, Pollutant identification.
Identifiers: Tissue analysis, Bioaccumulation, Trawl samples.

Extensive chemical and biological studies were undertaken during and following a 65,000 barrel crude oil spill to determine the fate of discharged oil and to determine the adverse effects of the oil in the marine environment. 2,000 barrels of chemical dispersants were sprayed. Hydrocarbon determinations were made of the water column, sediments, and tissue samples. Benthic organisms were enumerated and identified. Trawl samples were taken of fish, shrimp, and crab, and bioassays were made. Results were discussed. (Katz)
W76-00145

LONG-TERM EFFECTS OF AN OIL SPILL AT WEST FALMOUTH, MASSACHUSETTS,
Marine Biological Lab., Woods Hole, Mass.
For primary bibliographic entry see Field 5C.
W76-00146

DEVELOPMENT OF A RAPID AND SIMPLE TEST FOR BACTERIOLOGICAL WATER QUALITY UTLIZING LIMULUS LYSATE,
Montana State Univ., Bozeman. Dept. of Microbiology.
T. M. Evans, and D. G. Stuart.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 766, $5.25 in paper copy, $2.25 in microfiche. Research Report No 69, Montana University Joint Water Resources Research Center, Bozeman, September 1975. 102 p, 19 fig, 14 tab, 107 ref. OWRT A-080-MONT (1).

Descriptors: Water quality, *Water analysis, *Spectrophotometry, Microbiology, Assay, *Bioassay, *Bioindicators, Califorms, Bacteria, Enteric bacteria, *Pollutant identification, Pathogenic bacteria.
Identifiers: *Endotoxin, Limulus lysate assay, *Bacterial indicators.

The Limulus lysate assay (LLA) was used to measure the endotoxin content in stream water and was found to reflect the degree of bacterial contamination as measured by coliform, enteric, gram-negative and heterotrophic bacteria. On the basis of high positive correlations between bound endotoxin and coliform, enteric, gram-negative and heterotrophic bacteria, the measurement of bound endotoxin by the Limulus lysate assay was proposed as a rapid and sensitive test of bacterial water quality. Because of the assumptions that are inherent in using the LLA as a measure of bacterial water quality, more research is needed before the LLA can be generally applied. (Holje - Montana State)
W76-00174

STRATEGIES FOR WATER QUALITY MONITORING,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. K. Sherwani, and D. H. Moreau.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 765, $5.75 in paper copy, $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No 107, June 1975. 137 p, 7 fig, 45 tab, 39 ref, append. OWRT A-065-0NC (2) 14-31-0001-4033.

Descriptors: *Monitoring, *Networks, *Network design, Sampling, Design standards, Data collections, Water quality, Water data, Design criteria, Mathematical models, *Water quality standards, Stations, *North Carolina, Pollutant identification, Regulation.
Identifiers: *Monitoring strategies, Monitoring networks, *Water quality monitoring, Sampling frequency, Water quality data, Stream standards.

General guidelines are provided for the preliminary design of a water quality monitoring system. The design is defined as the specification of the parameters to be determined, the number and location of sampling stations, and the frequency of sampling. The role of several objectives in the determination of monitoring strategy is considered. The objectives are the characterization of stream water quality, enforcement of stream standards and the detection of long-term trends. Principal component analysis is used to identify important water quality parameters and to find the appropriate size of a monitoring network. Information content defined as the reciprocal of the variance of the estimate of the mean concentration is suggested as a valid criterion for the design of a monitoring network for the characterization of water quality. Impact index based on the probability, severity and frequency of violation, number of direct users of the stream water, predominant use and the size of stream is proposed for determining the priority of location in an enforcement network. A protocol for the sampling of non-print sources is presented. The Research Triangle area in North Carolina is used as a case study. A possible framework for the strategy of water quality monitoring is described. This consists of an initial one-time baseline data collection program and eventually three types of networks: (a) an extensive network at relatively large number of key points, (b) an intensive network in selected drainage subbasins, and (c) a regulation network. (Stewart-North Carolina State)
W76-00178

REGIONAL SEWERING AND GROUNDWATER QUALITY IN THE SOUTHERN SAN JOAQUIN VALLEY,
For primary bibliographic entry see Field 5B.
W76-00190

LABORATORY MODELING OF THERMAL STRUCTURE IN STAGNANT WATER,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 2H.
W76-00199

TOXIC HEAVY METALS IN GROUNDWATER OF A PORTION OF THE FRONT RANGE MINERAL BELT,
Colorado School of Mines, Golden. Dept. of Chemistry.
K. W. Edwards, and R. W. Klusman.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 039, $3.75 in paper copy, $2.25 in microfiche. Colorado Environmental Resource Center, Fort Collins, Completion Report Series No 67, June 1975. 33 p, 5 fig, 6 tab, 18 ref. OWRT A-023-Colo(1).

Descriptors: *Trace elements, Groundwater, Potable water, Pollution *Colorado, *Gas chromatography, *Heavy metals, Toxicity, *Pollutant identification, Water analysis, Copper, Lead, Manganese, Mercury, Analytical techniques.
Identifiers: *Anodic stripping voltammetry, Front Range Mineral Belt(Colo), Arsenic, Selenium, Antimony.

Anodic stripping voltammetry and gas chromatography have been investigated with respect to their suitability for multielement analyses of trace elements in natural waters. The elements of interest in this study of toxic and esthetically undesirable elements in the regional ground waters of the Front Range Mineral Belt are arsenic, cadmium, copper, iron, lead, manganese, mercury, selenium, silver, and zinc. Atomic absorptions spectrophotometry is commonly used for analysis of these elements but permits only one element to be determined at a time. Anodic stripping voltammetry was highly sensitive and suitable for determination of low concentrations of cadmium, copper, lead, manganese, and mercury. For most of these elements the reproducibility was excellent at the ppb concentration level. Compared with direct flame atomic absorption, this method was more sensitive but not significantly faster despite determination of several elements per analysis. Gas chromatography was investigated for analysis of arsenic, antimony, and selenium by generation and separation of their hydrides. The method was difficult to use effectively and not sufficiently sensitive for natural water anslysis.
W76-00274

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GROUND WATER CONTAMINATION IN INDIANA,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 5B.
W76-00276

COMPUTER MODEL GUIDES SALT WATER WELL CONSTRUCTION,
EBA Engineering Consultants Ltd. Edmonton (Alberta).
P. L. Hall.
Johnson Drillers Journal, Vol 47, No 1, p 1-2, January-February, 1975, 2 fig.

Descriptors: *Groundwater, *Water wells, *Pollution, Pollutant identification, *Computer models, Canada, Saline water intrusion, Data collections.
Identifiers: New Brunswick(Canada), Fish processing plants, Well spacing.

A computer model was designed to simulate salt water intrusion and the effects of both fresh and salt water wells on the movement of the salt water wedge. The study was conducted by the Provincial Municipal Engineering Division in New Brunswick, Canada to avert a serious shortage of fresh water supplies to the fish-processing industry in the area. The computer model showed that it was practical to construct salt water wells that would satisfy these conditions: (1) the salt water wells should not cause contamination of existing wells, (2) the salt water wells should control the extent of salt water intrusion, and (3) the salt water wells should decrease the flow of fresh ground water to the seas and thus provide a fresh water supply for a considerable period of time. The wells were placed in production before the end of 1973 and the salt water movement has been monitored and compared with the predicted movement. Results of the computer model have been of considerable value. (Campbell-NWWA)
W76-00285

LEAD, ZINC, AND COPPER IN SOILS OF URBAN STORM-RUNOFF RETENTION BASINS,
Agricultural Research Service, Fresno, Calif. Water Management Research.
H. I. Nightingale.
Journal of the American Water Works Association, Vol 67, No 8, p 443-446, August 1975. 3 fig, 4 tab, 13 ref.

Descriptors: *Surface runoff, *Urban runoff, Retention, *Lead, *Zinc, *Copper, *Drainage systems, *California, Heavy metals, Storm drains, Pollutants, Public health, Water pollution sources, Urban drainage, Watersheds(Basins), Drainage effects, Soil chemical properties, Flood control, Gasoline, Flooding, Soil contamination, Groundwater recharge, Flood control, Bermudagrass, Soil analysis, Recreation.
Identifiers: *Storm-runoff retention basins, *Fresno(Calif), Urban flooding, Leaded gasoline, Environmental health problems, Retention basins.

A study was made to determine the amounts of three metal contaminants found in the soils of urban storm-runoff retention basins. Soil samples were taken at various depths in the basins and analyzed for copper, lead, and zinc. Utilization of storm-drainage retention basins to control urban flooding is a water-management system that tends to concentrate street-surface contaminates into a small area. Results of the soil analyses were shown. (Henley-ISWS)
W76-00307

SPECTROSCOPIC INSTRUMENTS, SATELLITES AND COMPUTERS: NEW DIRECTIONS FOR MONITORING THE ENVIRONMENT,
Denver Research Inst., Colo.
For primary bibliographic entry see Field 7B.
W76-00315

COOLING TOWERS AND WATER QUALITY,
Environmental Science and Engineering, Inc., Gainsville, Fla.
For primary bibliographic entry see Field 5B.
W76-00316

ACCUMULATION AND ELIMINATING STUDIES OF FOUR DETERGENT FLUORESCENT WHITENING AGENTS IN BLUEGILL (LEPOMIS MACROCHITUS),
CIBA-GEIGY Corp., Greensboro, N.C. Dye-stuff and Chemicals Div.
C. R. Ganz, J. Schulze, P. S. Stensby, F. L. Lyman, and K. Macek.
Environmental Science and Technology, Vol 9, No 8, p 738-744, August, 1975. 5 fig, 4 tab, 20 ref.

Descriptors: *Organic compounds, Fish, Path of pollutants, Toxicity, Sampling, Analytical techniques, Water pollution effects, *Pollutant identification.
Identifiers: *Bluegill, Lepomis macrochirus, Tissue analysis, Bioaccumulation, FWA, *Fluorescent whitening agents, DASC-3, DASC-4, BSB, NTS-1, Flowthrough water systems.

Bluegill, Lepomis macrochirus, were exposed in dynamic flow through tank water systems to each of four sulfonated stilbene fluorescent whitening agents, (FWAs), DASC-3, DASC-4, BSB, and NTS-1, to determine to what degree these products accumulte in portions of the fish which may be consumed by humans. Only NTS-1 yielded tissue levels above those present in the tank water. FWA was completely eliminated from exposed fish within 14 days of their transfer to clean water. It was concluded that the compounds tested were likely to present little risk of accumulating and persisting in natural fish populations. (Klein)
W76-00318

EVALUATION OF SOME METHODS OF ANALYSIS FOR PETROLEUM HYDROCARBONS IN MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
J. W. Farrington, and G. C. Medeiros.
In: 1975 Conference on Prevention and Control of Oil Pollution;Proceedings, American Petroleum Institute, EPA and U.S. Coast Guard, March 1975, p 115-121, 4 fig, 3 tab, 27 ref.

Descriptors: *Clams, *Molluscs, Methodology, *Analytical techniques, *Chemical analysis, *Organic compounds, *Oil pollution, Evluation, Sampling, Gas chromatography, Marine animals, Water analysis, Bioindicators, Laboratory tests, *Pollutant identification.
Identifiers: *Virtis, *Soxhlet, Digestion methods, Bioaccumulation, Tissue analysis, Marcenaria mercenaria.

Soxhlet extraction, homogenization with Na2SO4 in a Virtis homogenizer, and KOH-methanol digestion methods of extracting hydrocarbons from marine organisms have been tested and compared using subsamples of a clam (Marcenaria mercenaria) homogenate. The amounts of hydrocarbons were determined gravimetrically and the composition was partially characterized by gas chromatography. There was a statistically significant difference between the results of the Virtis vs. Soxhlet and Soxhlet vs. digestion methods. However, in practice the difference was small and would be apparent only if large numbers of replicate measurements were made. (Klein)
W76-00320

THE FATE OF SPILLED NAVY DISTILLATE FUEL,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
P. J. Hearst.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 256, $3.75 in paper copy, $2.25 in microfiche. September 1974. 31 p, 7 fig, 6 tab, 11 ref.

Descriptors: *Oil wastes, *Oil spills, *Sea water, *Fuels, *Gas chromatography, Analytical techniques, *Pollutant identification, Persistence, Laboratory tests, Weathering, Water pollution sources, Evaporation, *Path of pollutants.
Identifiers: *Distillate fuels.

Laboratory weathering studies of four Navy distillate fuels on salt water showed that in thick films (5mm) the major portions of the oils (75-90%) did not evaporate in one week. These fuels are therefore relatively persistant oils. The physical properties did not change markedly and the thick emulsions or mousse, obtained with Navy special fuel oil were not obtained with the distillate fuels. Very thin films (0.1mm) evaporated much more rapidly, leaving residues of about 5%, whereas Navy special fuel oil left residues of 65%. The weathering characteristics are related to the distillation range as shown by gas chromatographic comparisons. (Katz)
W76-00323

A NEW MEASURE OF BIOTIC SIMILARITY BETWEEN SAMPLES AND ITS APPLICATION WITH A CLUSTER ANALYSIS PROGRAM,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Labs.
For primary bibliographic entry see Field 7B.
W76-00325

THE EFFECT OF PESTICIDES ON BYSSAL FORMATION IN THE COMMON MUSSEL, MYTILUS EDULIS,
Queens Univ., Belfast (Northern Ireland). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-00328

PCB CONTENTS IN SEVERAL SPECIES OF FLATFISH COLLECTED IN THE EASTERN BERING SEA, (IN JAPANESE),
Hokkaido Univ., Sapporo, Japan. Faculty of Fisheries.
M. Takagi, H. Murayama, and S. Soma.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 6, p 685-690, June 1975. 2 fig, 2 tab, 5 ref.

Descriptors: *Fish, *Organic compounds, *Chlorinated hydrocarbons, *Fish physiology, Laboratory tests, Fish eggs, *Polychlorinated biphenyls, Water pollution effects, *Pollutant identification.
Identifiers: *Flatfish, *Tissue analysis, Bioaccumulation, Liver, Muscle, *Bering Sea.

Materials used for the study of polychlorinated biphenyls (PCB) concentrations in the muscle, liver and egg of four species of flatfish were collected from 14 locations in the Eastern Bering Sea. Analysis proved that PCB concentrations in muscle ranged between 0.02-0.13 ppm with distinct differences within the same species dependent on the source location. PCB contents in liver samples ranged from 0.06-0.27 ppm, i.e. always higher than the muscle values, and egg PCB contents were 0.01-0.03 ppm, i.e. lower than muscle level. (Klein)
W76-00332

HISTOCHEMICAL OBSERVATIONS ON THE PERMEATION OF HEAVY METALS (T... TASTE BUDS OF GOLDFISH,
Kyoto Univ. (Japan). Dept. of Fisheries.
K. T. Vijayamadhavan, and T. Iwai.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 6, p 631-639, June 19... fig, 15 ref.

Descriptors: Fish, Metals, *Fish physiology, Mercury, Copper, Zinc, Lead, Path of pollutants, *Heavy metals, Water pollution effects, Pollutant identification.
Identifiers: *Goldfish, Carassius auratus, *Taste cells, *Tissue analysis, Bioaccumulation, *Histological effects, Taste buds.

The rate of metal permeation into taste cells of goldfish, Carassius auratus varied with metal type, the concentration of metallic ions in the medium, and the duration of exposure. Mercury permeated the fastest, followed by copper, zinc and lead. Mercury damaged not only the taste buds but the entire epithelial layers within 30 minutes. Lead affected mucous cells more than the taste buds. Two types of taste cells in the taste buds were evident during the early phase of exposure to copper, mercury and zinc. (Klein)
W76-00334

TOXICITY OF A LINEAR ALKYLATE SULFONATE DETERGENT TO LARVAE OF FOUR SPECIES OF FRESHWATER FISH,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W76-00337

FISH TOXICITY OF S-METHYL FENITROTHION,
Atlantic Biological Station, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 5C.
W76-00338

A SIMPLE AGAR PLATE METHOD, USING MICRO-ALGAE FOR HERBICIDE BIO-ASSAY OR DETECTION,
Bath Univ. (England). School of Biological Sciences.
S. J. L. Wright.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 1, p 65-70, July 1975. 2 fig, 8 ref.

Descriptors: *Methodology, *Technology, *Bioassay, *Algae, *Bioindicators, Herbicides, Toxicity, *Pollutant identification, Chlorella.
Identifiers: Pleurococcus, Biodetection, Agar plates.

A simple, inexpensive method was described for the bioassay of herbicides using micro algae (Chlorella and Pleurocossus) growing on agar plates. Results were obtainable after two days. The method was found suitable for biodetection of herbicide residues and toxicity studies on soil and aquatic pollutants. (Klein)
W76-00339

UTILIZATION OF ALGAL ASSAYS TO ASSESS THE EFFECTS OF MUNICIPAL, INDUSTRIAL AND AGRICULTURAL WASTEWATER EFFLUENTS UPON PHYTOPLANKTON PRODUCTION IN THE SNAKE RIVER SYSTEM,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
J. C. Greene, W. E. Miller, T. Shiroyama, and T. E. Maloney.
Water, Air and Soil Pollution, Vol 4, No 3-4, p 415-434, July-August, 1975. 11 fig, 3 tab, 9 ref.

Descriptors: *Algae, *Algal growth, *Primary productivity, *Nutrients, *Phytoplankton, Sampling, Growth rates, Laboratory tests, Nitrogen, Phosphorus, Bioassays, Water quality, Wastes, Bioassay, Water pollution effects.
Identifiers: *Snake River, *Selenastrum capricornutum.

Industrial wastes, natural phosphate levels, irrigation return flows, municipal wastes, and the decay of aquatic biota contribute to high concentrations of nitrogen and phosphorus which stimulate aquatic growth and thick algal blooms in the Snake River system. Algal assays (Selenastrum capricornutum) were conducted on waters of 18 Snake River and tributary sites to 1 determine if algal growth was consistent with results predicted from review of chemical analysis for orthophosphorus and total soluble inorganic nitrogen; (2) determine if algal yields were eliminated by P, N, or some other nutrient essential to algal growth; and (3) predict the effect of N or P additions on algal productivity. (Klein)
W76-00342

INSTRUMENTATION FOR MONITORING WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
R. Briggs.
Water Treatment and Examination, Vol 24, Part 1, p 23-45, 1975. 10 fig, 2 tab, 21 ref.

Descriptors: *Pollutant identification, *Instrumentation, *Monitoring, *Water quality, Sampling, Suspended solids, Heavy metals, Toxicity, Ammonia, Data collection.
Identifiers: Sensors, Land-based monitoring stations.

Methods and instrumentation for monitoring water quality currently used in Great Britain are reviewed. Required units and limits of accuracy for data from automatic water quality monitors are given for the parameters of temperature, dissolved oxygen, oxidized nitrogen, ammoniacal nitrogen, organic matter, suspended matter, conductivity, chloride, hardness, pH value, sunlight intensity, and dissolved carbon dioxide. In order to achieve consistency, standards must be set for sampling frequency and sampling position. Types of available land-based package water quality monitors are described and the field performance of selected land-based monitoring stations in the United Kingdom is analyzed. Telemetry networks for water quality monitoring and the connection between automatic and manual control schemes are discussed. Many optical devices have been developed to monitor suspended solids concentration in river waters and effluents, and such sensors are accurate as long as optical surfaces are kept clean and if enough frequent calibrations are carried out to correct for errors arising from variations in particle density and size distributions. Specific instrumentation for measuring organic pollution, monitoring heavy metal concentrations, measuring ammonia, and detecting toxicity of pollutants to aquatic life are presently being developed. (Kramer-FIRL)
W76-00360

MONITORING THE ENVIRONMENT,
Denver Research Inst., Colo.
C. F. Heins, F. D. Johnson, and E. C. Mangold.
Environmental Science and Technology, Vol 9, No 8, p 720-725, August, 1975.

Descriptors: *Monitoring, *Spectroscopy, *Satellites(Artificial), *Remote sensing, *Data processing, *Computer programs, Instrumentation, Environmental control, Automation, *Pollutant identification, Water pollution sources.
Identifiers: LANDSAT, GOES.

Four developments in environmental monitoring are examined. These are spectroscopy, satellite transmission of environmental data, remote sensing, and computerized data processing. Improvements in instrumentation and techniques have occurred in response to stringent environmental legislation. Spectroscopic instruments are used primarily for atmospheric monitoring. Satellites have been tested for the relay of collected data from remote, automatic collection systems. The earth resources satellite LANDSAT and a system of Data Collection Platforms (DCP's) are used to collect and transmit data in digital form from sensors. Another system, designed for hydrological, meteorological, and oceanogaphic data is made up of the Geostationary Operational Environmental Satellites (GOES), which are being used by both governmental agencies and industrial firms. Several remote sensors are also being developed, based on technologies of correlation spectrometry, infrared sensors, and LIDAR (light detection and ranging) systems. With the continued use of such sensing, data collection, and satellite transmittal devices, specialized computer programs for interpretation of data have become increasingly important. Software programs used to identify bodies of water, to trace the paths of storms, and to classify land usage through digital imagery are being developed to assimilate the quantities of information which may be obtained from these new methods of environmental measurement. (Kramer-FIRL)
W76-00361

RADIOCARBON AGES OF GROUND WATER AS A BASIS FOR THE DETERMINATION OF SAFE LIMITS OF AQUIFER EXPLOITATION,
Nova Univ., Fort Lauderdale, Fla. Life Science Center.
For primary bibliographic entry see Field 5B.
W76-00363

GROUND WATER GEOCHEMISTRY OF THE PAHASAPA LIMESTONE,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 2K.
W76-00375

TRACE ELEMENT COMPOSITION OF STREAM SEDIMENTS, AN INTEGRATING FACTOR FOR WATER QUALITY,
Arkansas Univ., Fayetteville. Water Resources Research Center.
K. F. Steele, H. C. MacDonald, G. H. Wagner, and W. S. Bowen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 045, $6.25 in paper copy, $2.25 in microfiche. Publication No 31, 1975. 160 p, 62 fig, 29 tab, 26 ref, append. OWRT A-025-ARK (3).

Descriptors: *Trace elements, Suspended solids, Dissolved solids, Geology, *Bottom sediments, Mineralogy, Water quality, *Arkansas, Sampling, *Pollutant identification, Tributaries, *Sediment transport, *Path of pollutants, *Metals, Spectrometry, X-ray fluorescences, Iron oxides, Adsorption.
Identifiers: *Buffalo River(Ark).

Bottom sediments, suspended sediments, and water were sampled along 130 miles of the Buffalo River in northern Arkansas. The water and acid extracts of the suspended sediments and the minus 95 mesh fraction of the bottom sediments were analyzed by atomic absorption spectrometry. All samples were analyzed for Na, K, Mg, Ca, Zn, Cd, Cu, Pb, Fe, Co, Cr, Ni, and Mn. Selected bottom samples also were analyzed for As, Hg, and Zr. Zr was determined by x-ray fluorescence. Li and Sr were determined for selected water and suspended sediment samples. There is a general decrease downstream in Fe, Cu, Cr, Ni, Mn, Pb, K, and Na in the bottom sediments as the drainage area increases in carbonate rock and decreases in shale. Mg, Ca, Zn, and Cd increase in bottom sediments downstream. The values for the these elements in the water, especially the major elements, also correspond closely with the geology of the region. Tributaries are sites of abrupt rise and fall of metal values, within a few miles, from background to anomalously high values to background, especially tributaries draining Zn and Pb mineralized areas. The bottom sediments are mainly quartz and chert grains. These grains apparently are coated with hydrous iron oxide which acts as a sorbent for many of the elements and is a domi-

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nant transport mechanism for acid extractable Co, Cr, Ni, Cu, Mn, and K. Other acid extractable metals, particularly Mg, Ca, Zn, Cd, and Pb. are mostly in clastic grains. Graphic representation of the Langmuir equation for Mn is consistent with adsorption of Mn by iron in both bottom sediments and suspended sediments.
W76-00377

EVALUATION OF A RECREATIONAL LAKE REHABILITATION PROJECT,
Dakota State Coll., Madison.
C. L. Churchill, C. K. Brashier, and D. Limmer.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 083, $4.75 in paper copy, $2.25 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, August 1975. 75 p, 13 fig, 20 tab, 19 ref, 2 append. OWRT B-028-SDAK (1). 14-01-0001-3936.

Descriptors: *Dredging, Shore protection, Lake shores, Lakes, Eutrophication, Biological communities, Nutrients, Sedimentation, Sediment yield, *South Dakota, *Phosphorus, *Diatons, *Cyanophyta, *Chlorophyta, Silts, Recreation, *Lake sediments, *Bottom sediments, Monitoring, *Pollutant identification, *Phosphates.
Identifiers: *Lake Herman(SD), Gabion silt traps, *Lake rehabilitation, Orthophosphates.

Lake Herman, a recreational, shallow, warm water prairie lake near Madison, South Dakota drains an extensively cultivated watershed and acts as a siltation basin for a chain of four lakes. The lake is more than half silted in and since 1968 various rehabilitation efforts have been made, including the construction of silt traps and lake dredging. Continuation of the monitoring of chemical levels and biological populations of green algae, blue-green algae and diatoms has revealed two major changes: (1) ortho phosphate and total phosphorus levels (which increased markedly with the beginning of dredging) have decreased since dredging has ceased, and (2) other parameters including conductivity, chloride, hardness, calcium, magnesium, potassium, and sodium have been gradually increasing since 1968. Lake bottom core samples show a pattern of decreasing levels of extractable and total phosphorus with depth. Silt deposit area cores, however, show no consistent variation of phosphorus with depth, and furthermore have significantly lower levels of extractable phosphorus than the upper portion of the lake cores. Measurement of the silt depth at forty sites in Lake Herman and comparison of these measurements with those taken at the same sites in 1967 have revealed that the silt volume of the lake has increased by 2,022 acre feet or 23.8% during the eight years from 1967 to 1975. (Wiersma-South Dakota State)
W76-00379

BACTERIOLOGICAL WATER QUALITY METHODS FOR DETERMINING RUMINANT FECAL POLLUTION,
South Dakota State Univ., Brookings,. Dept. of Microbiology.
P. R. Middaugh.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 047, $4.75 in paper copy, $2.25 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, June 1975. 56 p, 4 fig, 7 tab, 45 ref. OWRT A-037-SDAK (1). 14-31-0001-3542.

Descriptors: *Water pollution sources, *Farm wastes, *Pathogenic bacteria, Indicators, Bacteria, *Enteric bacteria, Bioindicator, Water quality, *Livestock wastes, Human diseases, *Microbiology, *Bioassay.
Identifiers: *Ruminant fecal pollution.

Studies have been completed on development of microbiological methods for detection of farm animal waste pollution of lake and river water. To differentiate ruminant fecal pollution from domestic sources, the fecal streptococcus, Streptococcus bovis, which is reported to be unique in ruminants, was detected by specific selective methods amd media. S. bovis cells are differentiated by their starch hydrolyzing ability. The method as developed utilizes a membrane filter, 0.45 micron porosity, to concentrate the S. bovis cells. In one method the membrane is placed on modified Kenner-Fecal Streptococcus agar in a 60 mm petri dish. An overlayer of 3 ml of 1% agar which contains 0.2% starch-dye complex, Remazol Brilliant Blue-R dye coupled to amylose starch, is placed on the membrane. The cells are incubated at 37C in a moist chamber with an atmosphere of 75% N2 and 25% CO2 gas for 24 to 48 hours. Visible clear zones develop around cells containing amylose or starch hydrolyzing ability. A further development uses commercial Pfizer Selective Enterococcus agar medium (modified to exclude esculin and with added 2, 3, 5 triphenyltetrazolium chloride to pigment the colonies red). In this method the membrane filter carrying the S. bovis cells is overlaid with 3 ml of the modified PSE agar to which was added 0.2% amylose-azure dye to indicate starch hydrolysis after anaerobic incubation. The method has been evaluated by tests on lakes and rivers. A small number of related streptococci also hydrolyze starch. These are typical S. faecalis cells which are biochemically differentiated, if necessary. (Wiersma-South Dakota State)
W76-00380

CHECK SAMPLING FOR MONITORING BACTERIOLOGICAL QUALITY.
Missouri State Div. of Health, Jefferson City. Bureau of Water Supply.
R. S. Miller.
Journal of the American Water Works Association, Vol 67, No 1, p 28-32, January, 1975. 8 tab.

Descriptors: *Monitoring, *Water quality control, *Water quality standards, *Data collections, Data transmissions, Maintenance, Measurement, Regulation, Operations, Water purification, Biological treatment, Biocontrol, Diseases, Government regulation, Government standards, State jurisdiction, *Missouri, *Pollutant identification, *Bacteria.
Identifiers: Check sampling.

The Division of Health, Missouri, requires that water samples of public supplies be submitted for testing on a routine basis. A minimum of four samples per month is required if the particular supply provides no treatment, and four samples per week if water is treated. Most large water supply plants maintain their own bacteriological laboratories and do not submit samples directly, but all water-testing results are sent to the Division of Health which also surveys laboratories for water testing approval. When a problem occurs in the distribution system, contamination is all too often the result of improper procedure in the collection and submission of samples. Two problems emerge: (1) the need for training to provide qualified operators who properly collect and submit samples for bacteriological analysis, and (2) the need to develop technology related to maintaining water quality in the distribution system through better cross-connection control programs and procedures for disinfection of water mains following breaks. Quality control could be improved if local or regional laboratories were available near small communities so that test results would be available quicker without the time delays necessitated by forwarding and returning sample containers to distant laboratories. Technological developments are also needed for more rapid and accurate monitoring to determine acceptable quality from a bacteriological standpoint. (Bradbeer-NWWA)
W76-00391

VIRUS PROBLEMS AND THEIR RELATION TO WATER SUPPLIES,
Environmental Protection Agency, Washington D.C. Div. of Water Supply.
J. H. McDermott.
Journal of the American Water Works Association, Vol 66, No 12, p 693-698, December, 1974 fig, 4 tab, 19 ref.

Descriptors: *Viruses, *Enteric, *Epidemics *Potable water, *Water supply, Diseases, Biocontrol, Microbiology, Epidemiology, Aquatic microorganisms, Animal wastes, *Water quality standards.
Identifiers: Hepatitus, Typhoid.

Two objectives of the federal drinking-water program have been to evaluate application of contemporary standards of good practice and to recommend appropriate remedies including priority areas for future research and development. Several studies using the 1962 Drinking Water Standards as the basis of performance evaluation have been conducted in recent years. They have shown that many citizens are not being provided with drinking water that meets contemporary standards. Unnecessary risks are being taken in the production and distribution of drinking water. Viruses are parasites. Consequently, their occurrence, growth, and transmission are depended upon the invasion of living cells. Many of the enteric viruses are actually or potentially waterborne. These viruses and the associated diseases are listed. Most of the enteric viruses in surface waters are probably the result of inadequately treated sewage. It has been estimated that only 10 percent of municipal wastes effluents are disinfected prior to discharges. Disease statistics must be viewed very critically. It is reasonable to assume that the reported cases represent only 10 percent of the actual number of cases. Further, many of these cases have not been attributed to a mode of transmission at all but are potentially waterborne. There is a need to determine if single virus particles are passing through water treatment plants, but there is an inadequacy in methods for sampling, detecting, identifying, and enumerating viruses in water samples. (Bradbeer-NWWA)
W76-00392

USE OF A BIOASSAY TEST IN EVALUATING THE TOXICITY OF DRILLING FLUID ADDITIVES ON GALVESTON BAY SHRIMP,
Milchem Inc., Houston, Tex.
B. G. Chesser, and W. H. McKenzie.
In: Conference on Environmental Aspects of Chemical Use in Well Drilling Operations, May 22-23, 1975, Houston, Texas, 19 p, 5 fig, 2 tab, 8 ref.

Descriptors: Pollution, *Neritic, *Shrimp, *Drilling fluid, *Additives, *Drilling, Estuaries, Lagoons, Commercial shellfish, *Toxicity, Lethal limit, *Bioassay, Toxins, Water pollution effects, Chromium, Sea water, Methods, Texas.
Identifiers: *Lignosulfate, Polyacrylate, Defoamer, Hemlock, Galveston Bay(Tex).

A bioassay test to determine the degree of toxicity of drilling fluid additives to shrimp is described. The method used is patterned after that given in the Standard Methods for the Examination of Water and Wastewater, 13th ed. prepared and published jointly by American Public Health Association, Water Pollution Control Federation and American Water Works Association. Methods of collecting, acclimatization and exposure as well as the test apparatus are described. The results of 96 hour salt water toxicity tests with several common drilling fluid additives are given. The test materials are modified hemlock bark extract, chrome treated lignosulfate, iron lignosulfate, non-water dispersable defoamer, low molecular weight polyacrylate, and cellulosic-calcium carbonate workover additive. The 50 percent toxicity level of brown or white shrimp is given for each of these. The study does not cover all drilling fluid additives but the procedure appears to be a reli

and meaningful approach to measuring the toxicity of most additives to shrimp. (Bradbeer-NWWA)
W76-00408

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
For primary bibliographic entry see Field 5B.
W76-00410

EVALUATION OF METHODS FOR THE ANALYSIS OF PHYSICAL, CHEMICAL AND BIOCHEMICAL PROPERTIES OF POULTRY WASTEWATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-00442

5B. Sources Of Pollution

RATES OF WATER ENTRY INTO THE SUBSOIL OF SEVERAL SOIL SERIES IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 5D.
W76-00008

THE SOLUBILITY OF FERRIC OXYHYDROXIDES IN NATURAL WATERS,
Kansas State Univ., Manhattan. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W76-00011

GROUND-WATER QUALITY IN THE SHIRAZ BASIN, SOUTH IRAN,
Tehran Univ., (Iran). School of Engineering.
For primary bibliographic entry see Field 2K.
W76-00012

POINT SOURCE DISPERSION IN TURBULENT OPEN CHANNELS,
Bogazici Univ., Istanbul (Turkey), Dept. of Mathematics.
For primary bibliographic entry see Field 8B.
W76-00014

VALIDITY OF SOIL-WATER SAMPLES COLLECTED WITH POROUS CERAMIC CUPS,
Forest Service (USDA) Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 5A.
W76-00024

SIMULTANEOUS TRANSPORT OF WATER AND ADSORBED SOLUTES THROUGH SOIL UNDER TRANSIENT FLOW CONDITIONS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-00032

CHEMICAL QUALITY OF WATER IN CONSERVATION AREA 2A AND ASSOCIATED CANALS,
Cental and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept.
For primary bibliographic entry see Field 5A.
W76-00033

RIVER QUALITY AND INDUSTRIAL ADJUSTMENT: A CASE STUDY,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 5G.
W76-00039

CHANGES IN RECIRCULATED WATER IN A PAPER MACHINE OVER A SIX DAY PERIOD (VERAENDERUNGEN IM KREISLAUFWASSER EINER PAPIERMASCHINE WAEHREND EINER 6 TAGE-BETRIEBSPERIODE),
Institut Papiertechnische Stiftung, Munich (Germany).
For primary bibliographic entry see Field 5D.
W76-00053

ORGANIC COMPOUNDS FROM KRAFT PULPING EFFLUENTS. III. PHENOLS (ORGANICHESKIE VESHCHESTVA STOCHNYKH VOD SUL'FATNOTSELLYULOZNOGO PROIZVODSTVA. III. FENOLY),
Vaesyuznyi-Nauchnyi Planovii Ozdel Tsellyulozno-Bumazhnoi Promyshlennost, Leningrad (USSR); and Leningradskii Lesotekhnicheskii Akademiya (USSR).
For primary bibliographic entry see Field 5A.
W76-00055

BIOLOGICAL CIRCULATION OF SALTS IN SALINIZED SOILS OF GEORGIAN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W76-00081

ACCUMULATION, RELEASE, AND DISTRIBUTION OF BENZO (A) PYRENE -C14 IN THE CLAM, RANGIA CUNEATA,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-00137

MORPHOLOGICAL ANOMALIES IN ADULT OYSTERS, SCALLOP, AND ATLANTIC SILVERSIDES EXPOSED TO WASTE MOTOR OIL,
Environmental Protection Agency, National Marine Water Quality Lab., West Kingston, R.I.
For primary bibliographic entry see Field 5C.
W76-00138

FATE OF PETROLEUM HYDROCARBONS IN MARINE ZOOPLANKTON,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W76-00144

CHEVRON MAIN PASS BLOCK 41 OIL SPILL: CHEMICAL AND BIOLOGICAL INVESTIGATIONS,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5A.
W76-00145

FATE AND EFFECTS OF CRUDE OIL ON AN ESTUARINE POND,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 5C.
W76-00148

AN EXPERIMENTAL OIL SPILL: THE DISTRIBUTION OF AROMATIC HYDROCARBONS IN THE WATER, SEDIMENT, AND ANIMAL TISSUES WITHIN A SHRIMP POND,
Texas Agricultural Extension Service, College Station.
For primary bibliographic entry see Field 5C.
W76-00149

INFLUENCE OF ORGANIC NITROGEN ON SOIL NITROGEN, NODULATION, NITROGEN FIXATION, AND YIELD OF SOYBEANS,
Maryland Univ., College Park. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W76-00157

DEVELOPMENT OF A RAPID AND SIMPLE TEST FOR BACTERIOLOGICAL WATER QUALITY UTLIZING LIMULUS LYSATE,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-00174

REGIONAL SEWERING AND GROUNDWATER QUALITY IN THE SOUTHERN SAN JOAQUIN VALLEY,
K. D. Schmidt.
Water Resources Bulletin, American Water Resources Association, Vol 11, No 3, p 514-525, June 1975. 4 fig, 9 ref.

Descriptors: *Sewerage, *Water pollution, *Seepage, *Tracers, California, Sewage effluents, Waste water(Pollution), Water pollution sources, Sewage systems, Pipelines, Water quality, Groundwater recharge, Chlorides, Water supply, Sewers, Sewage, Leakage.
Identifiers: Fresno(Cal), Fresno sewage treatment plant, San Joaquin Valley, Regional sewering, Leakage of raw sewage.

Sewage effluent is commonly disposed of on land in arid regions, and the majority usually recharges the groundwater. This study evaluated the effect of sewering programs on groundwater quality. Samples were taken near the Fresno sewage treatment plant with chloride content used for effluent tracing. Recharge effluent was traced for about 10 miles indicating probable large amounts of leakage of raw sewage into the groundwater between Fresno and the treatment plant. (Robinett-Arizona)
W76-00190

ENVIRONMENTAL IMPACTS OF SALINE SEEP IN MONTANA,
Western Interstate Commission for Higher Education, Boulder, Colo.
For primary bibliographic entry see Field 2F.
W76-00193

LABORATORY MODELING OF THERMAL STRUCTURE IN STAGNANT WATER,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 2H.
W76-00199

GROUND WATER CONTAMINATION IN INDIANA,
Geological Survey, Indianapolis, Ind. Water Resources Div.
D. G. Jordan.
Journal of the American Water Works Association, Vol 54, No 10, p 1213-1220, October, 1962. 5 fig.

Descriptors: Pollution, *Groundwater, *Pollutant identification, *Water pollution, Waste disposal, Land disposal, Oil industry, Phenols, Sulfates, Bacteria, *Saline water, Brines, *Indiana, Brine disposal.
Identifiers: Bacterial contamination, Oilfield brines, Evaporation pits, Sulfate, Chromite.

Ground water quality changes that indicate contamination have been observed in several places in Indiana. Most of the contamination is local, but regardless of type, extent, and severity, its cause can generally be traced to the action of man. Some of the types of contamination in the state and the cause and effect of specific types are described. Bacterial contamination by septic-tank effluent is a potential threat to ground water supplies in many cities and country areas of the state. Saline water of high chloride content is the largest single contaminant of fresh ground water in the state. Aquifers in the coal-mining areas of the state are being contaminated by infiltration of water con-

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taining high concentrations of sulfate. Four occurrences of chromate contamination have been reported in the state. Contamination by phenol is reported at a well field in Elkhart, Indiana. In many situations, many years must elapse after a source of contamination has been identified and eliminated before the ground water again becomes potable. Early recognition of such contamination is urged. Effective controls are also needed for surface and subsurface disposal of concentrated solid and liquid waste products. (Campbell-NWWA)
W76-00276

FERTILIZER APPLICATION RATES AND NITRATE CONCENTRATIONS IN ILLINOIS SURFACE WATERS,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
R. Klepper, R. Parker, B. Commoner, and G. Shearer.
Illinois Institute for Environmental Quality, Chicago, Document No 74-38, December 1974. 85 p, 6 fig, 25 tab, 32 ref.

Descriptors: *Water pollution sources, *Fertilizers, *Nitrates, *Illinois, Water pollution, Pollutants, Nutrients, Chemicals, Nitrogen compounds, Agriculture, Farm management, Corn(Field), Crops, Corn belt, Agricultural watersheds, Water quality, Streams, Surface waters.

In recent years, during the spring months, the concentrations of nitrate in certain Illinois rivers have approached and sometimes exceeded the acceptable limit established by public health agencies--10 parts per million (ppm) of nitrate-nitrogen. The issue has been raised as to what action, if any, should be taken to correct this situation. An analysis was made of the relationship between observed concentrations of nitrate in Illinois rivers and the rate of application of nitrogen fertilizer to Illinois farm- lands, and this analysis was used to determine what influence various limitations of the rate of nitrogen application might be expected to have on nitrate levels. It was concluded that the nitrate problem is not a statewide problem in Illinois given a 10 ppm nitrate-nitrogen standard. It is concentrated in east central Illinois and is less acute in west central and northern Illinois. There would appear to be no problem in southern Illinois streams. The difference from region to region in the distribution of nitrogen fertilizer application rates and the fraction of acreage planted to corn leads to differences between regions in the estimates of limits on the rate of application of fertilizer nitrogen to corn which would be required to reduce nitrate concentrations to given levels. (Sims-ISWS)
W76-00290

THE DEPOSITIONAL ENVIRONMENT OF ZINC, LEAD AND CADMIUM IN RESERVOIR SEDIMENTS,
Tulsa Univ., Okla. Dept. of Earth Sciences.
F. W. Pita, and N. J. Hyne.
Water Research, Vol 9, No 8, p 701-706, August 1975. 8 fig, 3 tab, 16 ref.

Descriptors: *Sediments, *Suspended load, *Cadmium, *Lead, *Zinc, *Reservoirs, *Oklahoma, Correlation analysis, Mining, Reservoir silting, Selectivity, Sinks, Regression analysis, Model studies, Trap effieiency, *Deposition(Sediments), *Heavy metals, Sedimentation, Pollutants, On-site investigations.
Identifiers: Fort Gibson Reservoir(Okla).

Despite low water retention dams and intervening reservoirs, reservoirs located down- stream from a lead-zinc mining and milling area were found to contain relatively higher concentration of zinc, lead, and cadmium than were found in reservoirs outside the area. The metals were found to be concentrated in reservoir bottom sediments relative to metals concentration in surrounding soils. High trap efficiencies of upstream reservoirs and retention dams seemingly assure that transportation of heavy metals into the affected reservoirs is by suspended and dissolved loads. Zinc and lead contents were closely correlated to depth of water, organic content, and percentage of clay-size sediments. Zinc is preferentially weathered and transported from its source relative to lead. A model was developed in which lead and zinc are transported by ionic and/or organo-metallic solution into reservoirs. Using the postulated model, estimates were made of the removal efficiency in Fort Gibson Reservoir. study results estimated an average removal of 0.3 parts per million zinc and 0.04 parts per million lead from waters passing through Fort Gibson Reservoir. (Harmeson-ISWS)
W76-00292

SURVEY OF GROUND-WATER PROTECTION METHODS FOR ILLINOIS LANDFILLS,
Illinois Environmental Protection Agency, Springfield, Div. State of Land Pollution Control.
T. P. Clark.
Ground Water, Vol 13, No 4, p 321-331, July-August 1975. 5 fig, 8 tab, 14 ref.

Descriptors: *Landfills, *Water quality, *Groundwater, *Water pollution, *Protection, *Illinois, Monitoring, Water pollution control, Aquifers, Leachate, Water table, Environmental engineering, Garbage dumps, Water quality control, Observation wells, Piezometers, Methodology, On-site investigations, Wastes, Solid wastes, Waste treatment, Linings.
Identifiers: *Site selection, Protection methods.

The experience in Illinois of development of a rational program for protection of ground and surface water from the indiscriminant disposal of solid wastes is summarized. Classes of solid waste sites recognized and their position in terms of the hydrogeologic environment were presented. Means of controlling landfill leachate, either by natural renovation in subsurface materials or by engineered collection and treatment were discussed. Examples were presented which illustrate the in-field implementation of protective systems and monitoring devices for groundwater in Illinois, which should be generally applicable to other areas of the country of similar geology and climate. (Prickett-ISWS)
W76-00293

LEAD, ZINC, AND COPPER IN SOILS OF URBAN STORM-RUNOFF RETENTION BASINS,
Agricultural Research Service, Fresno, Calif. Water Management Research.
For primary bibliographic entry see Field 5A.
W76-00307

EFFECT OF CESSPOOL DISCHARGE ON GROUND-WATER QUALITY ON LONG ISLAND, N.Y.,
Nassau County Health Dept. Mineola, N.Y. Environmental Conservation Programs.
S. O. Smith, and D. H. Myott.
Journal of the American Water Works Association, Vol 67, No 8, p 456-458, August 1975. 7 fig, 2 tab.

Descriptors: *Cesspools, *Infiltration, *Groundwater, *Groundwater recharge, *Nitrates, *New York, Percolating water, Aquifer management, Water quality, Recharge, Waste disposal, Detergents, Leaching, Sewers, Urban hydrology, Aquifers, Urbanization, Water pollution, Water supply.
Identifiers: *Long Island(NY).

Large amounts of household wastes, discharged through cesspools, have resulted in deterioration of groundwater quality on Long Island. Although nitrate pollution poses the greatest threat to the Island's water supplies, other constituents derived from cesspool leachings are increasing. Municipa sewering projects which have been undertaken a a solution were discussed. Water suppliers in th county have undertaken various steps to cope wit water quality deterioration, including blendin water from two or more wells to produce an ac ceptable drinking water, deepening existing well or abandoning and replacing unusable wells. Th long range solution undertken is an extensiv sewering project begun in 1949. Present plans ca for 80% of the population to be sewered by 199 but escalation of sewering costs have made the a complishment of this task difficult (Pricket ISWS)
W76-00308

COOLING TOWERS AND WATER QUALITY,
Environmental Science and Engineering, In Gainsville, Fla.
C. L. Stratton, and G. F. Lee.
Journal Water Pollution Control Federation, V 47, No 7, p 1901-1912, July 1975. 9 tab, 10 ref. EP T-90014.

Descriptors: *Cooling towers, *Water quali *Air conditioning, *Chemical properties, *Wat pollution sources, Eutrophication, Nutrients, P lutants, Water analysis, Heavy metals, Evapo tion, Physical properties, Analytical technique Nitrogen, Phosphorus, Nitrates, Pollutant identi cation, Chemicals, Analysis, Effluents, Envir mental effects, Waste water(Pollution), H water, *Thermal pollution.
Identifiers: *Cooling tower blow down.

A survey of the chemical composition of blo down waters from 11 cooling tower installatio in which different chemical treatments are us was presented. The study found that cooling tow installations are a potential source of water qual problems as a result of NH4(+), NO3(-), SO4(Zn, Fe, Cu, Cr, Pb, Hg, orthophosphate, and t phosphate concentrations in the effluent wa Certain of these chemical species are toxic aquatic organisms and others tend to prom eutrophic conditions in the receiving water at concentrations observed in blowdown wa without treatment. (Henley-ISWS)
W76-00316

PCB'S IN SUBURBAN WATERSHED, RESTO VA.,
Federal Energy Administration, Washington, D.
J. M. Martell, D. A. Rickert, and F. R. Siegel.
Environmental Science and Technology, Vol 9 872-875, September 1975. 2 fig, 2 tab, 9 ref.

Descriptors: *Organic compounds, *Urbanizati Sampling, Water quality, Wastes, Water pollut sources, Analytical techniques, *Polychlorina biphenyls, *Virginia, Lakes.
Identifiers: *Real Estate Lakes, PCB, L Anne(Va), Reston(Va), Urban watersheds.

Polychlorinated biphenyl concentrations in L Anne basin, Virginia, increased from w (<0.05-0.2 ppb), to bed sediment (<2.5-105 p to fish (140-700 ppb) in an average ratio 1:500:3000. The highest concentrations were served in the lake, which is 10 years old, receives no sewage or industrial waste dischar Evidence indicated that the polychlorin biphenyls (PCB's) originate from diffuse sou associated with urban development and li (Klein)
W76-00319

THE FATE OF SPILLED NAVY DISTILL FUEL,
Civil Engineering Lab. (Navy), Port Huen Calif.
For primary bibliographic entry see Field 5A.
W76-00323

PRELIMINARY ENVIRONMENTAL HAZARD ASSESSMENT OF CHLORINATED NAPHTHALENES, SILICONES, FLUOROCARBONS, BENZENEPOLYCARBOXYLATES, AND CHLOROPHENOLS,
Syracuse Univ. Research Corp., N.Y.
For primary bibliographic entry see Field 5C.
W76-00326

THE CATASTROPHIC DRIFT OF STREAM INSECTS AFTER TREATMENTS WITH METHOXYCHLOR (1,1,1-TRICHLORO-2,2-BIS(P-METHOXYPHENYL) ETHANE),
Waterloo Univ. (Ontario). Dept. of Biology.
R. R. Wallace, and H. B. N. Hynes.
Environmental Pollution, Vol 8, No 4, p 255-268, June 1975. 10 fig, 4 tab, 22 ref.

Descriptors: *Insecticides, Insects, *Chlorinated hydrocarbon pesticides, Streams, *Insect control, Growth stages, Larvae, Toxicity, Mortality, Selectivity, Biomass, Sampling, Environmental effects, *Aquatic insects, Canada, Path of pollutants.
Identifiers: *Methoxychlor, *Insect drifts, Bioaccumulation, Trichoptera, Simuliidae, Plecoptera, Ephemeroptera.

The catastrophic drift of aquatic insects after two experimental treatments with methoxychlor for the control of larval Simuliidae was studied in streams in Quebec. The treatments were administered from ground-level and from aircraft. There was a copious drift of dead and dying insects after the treatments. In both streams, simuliid larvae comprised only a small portion of the total drift of insects, indicating that the chemicals were not selective for Simuliidae. Most of the drift occurred within 150 minutes of the beginning of the treatments. The pattern of drifting insects after the treatments was similar for both streams, the numbers of insects caught increased rapidly to a maximum value, and then tapered off. Spraying of the length of a stream was not recommended for commercial control operations. (Klein)
W76-00327

EQUILIBRIUM AND STABILITY IN LABORATORY MODELS OF SEWAGE PONDS AND POLLUTED RIVERS,
Technische Universitat, Dresden (East Germany). Bereich Hydrobiologie.
For primary bibliographic entry see Field 5C.
W76-00331

FLAME RETARDANT RELEASE FROM FABRICS DURING LAUNDERING AND THEIR TOXICITY TO FISH,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
For primary bibliographic entry see Field 5C.
W76-00340

ON OCCURRENCE OF SIMILAR ORGANISMS TO GYMNODINIUM BREVE DAVIS IN OMURA BAY, (IN JAPANESE),
Nagasaki Univ., (Japan) Faculty of Fisheries.
S. Iizuka.
Bulletin of the Plankton Society of Japan, Vol 21, No 2, p 109-112, April 1975. 5 fig, 5 ref.

Descriptors: *Pimary productivity, Aquatic life, *Aquatic microorganisms, Bays.
Identifiers: *Gymnodinium breve, *Morphology, Omura Bay(Nagasaki), Red tide, *Japan.

Gymnodinium breve, one of Florida's Red Tide organisms, was distinguished from other Gymnodinium by the characteristic dome-like hump at the apex. Organisms with similar morphological features to G. breve were found in Omura Bay, Nagasaki Prefecture. The occurrence and cellular concentration of these organisms were insufficient to carry out culture experiments or detailed observations. (Klein)
W76-00341

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,
Massachusetts Inst. of Tech. Cambridge, Dept. of Civil Engineering.
F. M. M. Morel, J. C. Westall, C. R. O'Melia, and J. J. Morgan.
Environmental Science and Technology, Vol 9, No 8, p 756-761, August, 1975. 4 fig, 2 tab, 14 ref.

Descriptors: *Path of pollutants, *Heavy metals, *Environmental effects, *Sewage disposal, *California, Sediments, Zinc, Mercury, Gold, Copper, Cadmium, Lead, Chromium, Iron, Nickel, Cobalt, Manganese, Outfall sewers, Waste disposal, Pollutant identification, Water pollution effects.
Identifiers: Trace metals, Ocean disposal, *Los Angeles County(Calif).

Possible long range and short range effects of disposal of sewage containing trace metals into the coastal environment were investigated in Los Angeles County, California. Concentrations of various metals in sediments adjacent to a major outfall system were analyzed from amounts of Zn, Hg, Ag, Cu, Cd, and Pb (found in very insoluble sulfide), Cr and Fe (found in oxide forms), and Ni, Co, and Mn (Which are relatively insoluble). The Los Angeles County area sewage is unusually reduced and metal-rich in nature, and probably a typical of most sewage discharged from marine outfalls. However, studies of oxidation and dilution of the sewage by seawater indicated that most metals were solubilized upon ocean disposal and were well dispersed. The question of whether nearby sediments are a mixture of naturally occurring sediments and sewage particulate was left unanswered. It was estimated that 0.5% to 1.0% of the sewage organics are deposited. Further research on the interactions of suspended particulate matter for a better understanding of the fate of metal pollutants in waste water is recommended. (Kramer-FIRL)
W76-00355

TRACE ELEMENTS IN CORN GROWN ON LONG-TERM SLUDGE DISPOSAL SITE,
National Environmental Research Center, Cincinnati, Ohio, Advanced Waste Treatment Research Lab.
M. B. Kirkham.
Environmental Science and Technology, Vol 9, No 8, p 765-768, August, 1975. 4 tab, 18 ref.

Descriptors: Trace elements, *Pollutant identification, Toxicity, Municipal wastes, Sludge disposal, Sewage disposal, Analytical techniques, Soil analysis, *Corn(Field), Ohio.
Identifiers: Trace metals, Land application, Dayton(Ohio).

Sludge has been applied to land both for disposal purposes and for use as a soil conditioner and fertilizer, and concern has been expressed as to long-term concentrations of trace elements present in the dewatered sewage. An investigation was made as to whether plants grown on these soils might accumulate trace metals in amounts toxic to man or animals eating the crop. Corn plants (Zez mays L.) grown on soil treated with municipal sludge for 35 years in Dayton, Ohio, at a rate of 28 metric tons of sludge/ha/yr; plants from a plot that had been saturated with supernatant from sludge-holding lagoons from 1968 to 1971; and plants grown in a control plot that had never received sludge, were compared for trace element concentration. Their grains were analyzed for Al, Cd, Cu, Fe, Mn, Ni, Pb, and Zn. Soil in each area was analyzed to the 36-inch depth for total and dilute acid extractable concentrations of the trace elements. It was found that total concentrations of the elements in the 0 to 12-inch depth of soil were increased by sludge additions by the following factors: Al, 1.1; Cd, 35; Cu, 16.5; Fe, 1.1; Mn, 1.2; Ni, 2; Pb, 16.5; and Zn, 13. However, although these large amounts of trace elements accumulated in the soil, they did not accumulate significantly in the grain of corn plants grown in the treated soil when compared to control plants. The roots of the plants did contain large amounts of the elements, and concentrations of Cd and Cu in the leaves were found to be higher than normal. (Kramer-FIRL)
W76-00359

MONITORING THE ENVIRONMENT,
Denver Research Inst., Colo.
For primary bibliographic entry see Field 5A.
W76-00361

RADIOCARBON AGES OF GROUND WATER AS A BASIS FOR THE DETERMINATION OF SAFE LIMITS OF AQUIFER EXPLOITATION,
Nova Univ., Fort Lauderdale, Fla. Life Science Center.
M. A. Tamers, J. J. Stipp, and R. Weiner.
Environmental Research, Vol 9, No 3, p 250-264, June, 1975. 4 fig, 2 tab, 18 ref.

Descriptors: *Aquifers, *Groundwater, *Water supply, *Potable water, *Radioactive dating, *Florida, Water demand, Deep wells, Rainfall, *Pollutant identification, *Water pollution sources, Water quality standards.

The population that can be rationally supported by a municipal aquifer is a function of groundwater renewal rates. Thus, the age of groundwater of the Biscayne aquifer in south Florida was determined using radiocarbon dating techniques. This method provides a safe way to measure the water supply available. Dissolved carbonates were the material for age determination, with limestone dilution corrections of the measured carbon 14 activities made by comparisons of the relative concentrations of bicarbonate and total carbonates. The annual amount of water extracted must not exceed the quantity of rainfall that infiltrates underground in unpolluted zones. It was found for this area that the Hialeah-Preston well fields near Miami are intensively exploited, but produce deep well water free of contamination. The waters presently extracted by the deep wells are below the shallower depths influenced by untreated sewage disposal. For Dade County, and particularly the area around Miami, it was strongly recommended that unless present water treatment methods are improved significantly, the population should not be allowed to double. Deep municipal wells which now extract water are too close to the contaminated zone to permit an increased amount of pumpage without endangering public health. (Kramer-FIRL)
W76-00363

RAIN RECORDINGS AS BASIS FOR THE DIMENSNIONING OF RIN RUNOFF SYSTEMS (REGENSCHREIBERAUFZEICHNUNGEN ALS GRUNDLAGE ZUR DIMENSIONIERUNG VON REGENWASSERABLEITUNGSALAGEN),
H. Bosold.
Wasserwirtschaft-Wassertechnik, Vol 25, No 5, p 176-178, 1975. 8 fig, 2 tab, 5 ref.

Descriptors: *Mathematical models, *Rainfall, Measurement, Monitoring, *Strom runoff, *Rainfall-runoff relationships.
Identifiers: Rain water yields, *East Germany.

Rain water yields in liters/second were calculated for the Leipzing and Halle-Kroellwitz areas, East Germany, on the basis of pluviometric recordings and were compared to the conventional Reinhold calculations. The recordings were used in such a manner that each individual rainfall was arranged with its average rain yield as a function of the number of the rainfall hours per year and the number of the rainfall events according to their intensity, regardless of intensity fluctuations. The rain yield duration and rain yield frequency curves obtained for the two monitoring stations showed

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very few differences, which implies their applicability to the entire Halle-Leipzig area. However, considerable differences in storm runoff may be found to occur between the local and Central European rain yields. (Nave-FIRL)
W76-00365

ANALYSIS OF NONPOINT-SOURCE POLLUTANTS IN THE MISSOURI BASIN REGION,
Midwest Research Inst., Kansas City, Mo.
A. D. McElroy, F. Y. Chiu, and A. Aleti.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-600/5-75-004, March, 1975. 163 p, 35 fig, 13 tab,4 append. PE 1BA030 16 AFN 03 68-01-1863.

Descriptors: *Water pollution sources, Path of pollutants, *Missouri River, Data collections, Data processing, *Land use, Water quality, *Regression analysis, Correlation analysis, Model studies, *Computer models.
Identifiers: *Non-point source pollution.

A study of nonurban, nonpoint sources of pollution in the Missouri Basin utilized a unique, computer-based data system. The Data Bank contains extensive information on land use, soil, climate, water quality, and other parameters in the Missouri Basin. The current study was concerned with the adequacy of the Data Bank relative to development of nonpoint pollution models. Evaluation of information in the Data Bank yielded detailed land use and water quality profiles in the basin. The results show that the Data Bank is a useful base to depict the basinwide relations between various land uses and water quality. Regression equations of these relationships were developed for individual subbasins as well as for the entire basin. The regression equations, and the accompanying statistical analysis of significance, indicated that the water quality parameters NO3, BOD, and turbidity correlate well with land use on a basinwide basis. Other parameters, namely phosphorus, dissolved oxygen, and dissolved solids, did not correlate well with land use. (EPA)
W76-00369

MOVEMENT OF TRACE METALS WITH PERCOLATING WATER,
Rhode Island Univ., Kingston. Dept. of Civil Engineering; and Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
M. C. Wang, and V. A. Nacci.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 104, $3.75 in paper copy, $2.25 in microfiche. Completion Report, (1975). 38 p, 24 fig, 1 tab, 12 ref. OWRT A-052-RI (1). 14-31-0001-5040.

Descriptors: *Path of pollutants, *Cation exchange, Cation adsorption, Metals, Soils, Clay minerals, Groundwater, Ions, Water Pollution, Wells, Lysimeters, Trace elements, *Percolating water, *Soil texture, Adsorption, *Copper, *Lead, Percolation, Ion exchange.
Identifiers: *Trace metals, *Metal ions.

The major objective was to study the mechanism of movement of trace metals in soils with percolating water. The parameters that were considered to affect the metal ion movement in soil included: soil texture, type and content of clay mineral, metal ion, hydraulic conditions, temperature and acidity. Several native soils and commercial clays were used to study the soil-metal ion interaction and movement of metal ions through the soils was determined by using soil lysimeters. The adsorption ability of the soils proved to be related to such soil physical properties as percent of clay size and plasticity index and the chemical property cation exchange capacity. The adsorption of Cu++ was considerably faster than that of Pb++ for two native soils which corresponds to the results of laboratory adsorption tests and soil boundary hydraulic conditions.
W76-00374

GEOCHEMICAL AND SEDIMENTOLOGICAL ANALYSIS OF TYGART LAKE, WEST VIRGINIA,
West Virginia Univ., Morgantown, Dept. of Geology.
M. L. Collin.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 046, $3.75 in paper copy, $2.25 in microfiche. West Virginia Water Research Institute, Morgantown Information Report 7, 1975. 41 p, 17 fig, 34 ref.OWRT A-009-WVA(1).

Descriptors: *Clay minerals, *Bottom sediments, *Geochemistry, *Pollutants, *Reservoirs, *Acid mine water, *Sewage, Colloids, Lake sediments, Reservoir silting, Limnology, Cation exchange, Cation adsorption, Sediment-water interfaces, Acid Streams, Acidic water, *West Virginia, Lakes, Artificial lakes, Sediments, Pollution, Aquatic environment, Entrainment, Clays, *Lake sediments.
Identifiers: *Clay fixation, Sediment environment, Sediment profile, Chemical quality, Tygart Lake(WVa).

This study was directed toward obtaining a clearer understanding of the sediment environment of Tygart Lake, a U.S. Army Corps of Engineers reservoir. The reservoir water is acid. Turbulence and total solids were found to be low. The sediment contained clay in proportions varying from 4.1 to 18.3 percent of the total. All parameters of the sedimentary clay exhibited clear patterns of lateral change from the dam toward the Tygart Valley River inlet, and with depth from the sediment-water interface to the base of the sampled core. For loss on ignition, cation exchange capacity, clay content, and the cations of nitrogen, phosphorus, calcium, iron, and magnesium, a decrease in percentages or absolute amounts were detected laterally from the dam toward the Tygart Valley River inlet, an increase was observed with depth in the sediment profile. For silicon, aluminum, and potassium cations, the patterns were reversed, so that increases were noted laterally from the dam toward the river inlet, and decreases were marked with depth in the sediment profile. Kaolinite, illite, vermiculite and minot amounts of montmorillonite were present. Further year-round study of the geochemistry of several limnic basinal areas will be required to verify any general occurrence of patterns of pollutant accumulation within clay sediment.
W76-00376

TRACE ELEMENT COMPOSITION OF STREAM SEDIMENTS, AN INTEGRATING FACTOR FOR WATER QUALITY,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W76-00377

BACTERIOLOGICAL WATER QUALITY METHODS FOR DETERMINING RUMINANT FECAL POLLUTION,
South Dakota State Univ., Brookings,. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-00380

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
D. O. Gregg, and K. G. Kennedy.
Conference on Environmental Aspects of Chemical Use in Well-Drilling Operations, May 21-23, 1975, Houston, Texas, 19 p. 6 fig, 1 tab, 8 ref.

Descriptors: Pollution, *Groundwater movement, *Chemical wastes, Movement, *Path of pollutants, Leaching, Percolation, Soil contamination, *Water pollution sources, Chemical precipitation, Sorption, Ion exchange, Wastes.
Identifiers: Chemical contaminants.

The movement and dilution of chemical contaminants in a ground-water system are mainly controlled by the physical processes of convection transport and dispersion, by the geochemical processes of ion exchange, sorption, precipitation, and, in some cases, radionuclide decay, and biological processes. The discussion of several case histories of contamination of ground water systems illustrates the effects of the variability of the system itself and the properties of the fluid on the movement and dilution of chemical contaminants. The amount of data needed to determine the origin and path of contaminants is very large. There are few easy ways to determine the vertical and lateral extent, the rate and direction of movement, and the dilution of ground water contamination in many systems. (Bradbeer-NWWA)
W76-00410

DEVELOPMENT OF A NITROGEN BALANCE IN A LABORATORY SOIL PROFILE WITH A HEAVY APPLICATION OF BEEF CATTLE WASTES,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
J. A. George.
MS Thesis, 1970. 136 p, 6 fig, 10 tab, 8 ref.

Descriptors: *Cattle, *Soil profiles, Feed lots, Denitrification, Sampling, Analyses, *Farm wastes, Nitrogen, Path of pollutants, Water pollution sources.
Identifiers: *Nitrogen balance.

The purpose was to study the nitrogen cycle as it occurs in a soil profile with a high loading rate of beef feedlot wastes. In order to study denitrification under as natural conditions as possible and in order to determine a total nitrogen balance, an apparatus which combined the total soil profile of a lysimeter, the closed gas collection system of an incubation apparatus and the soil solution sampling ability of a soil percolation apparatus was designed. The results of 13 test runs revealed few solid facts about denitrification. They did indicate that part of the apparatus had great potential and that other parts needed further development and experimentation. The gas measuring and analysis part of the unit did not produce usable data, but the water sampling system produced quite good data. The soil and manure analysis data indicated that a considerable loss of nitrogen from the soil column occurred. Less than 10 percent of the total nitrogen loss from the soil was leached out in the water samples, indicating that the drawing off of water samples removes a minimum of nitrogen from the scene of active transformations. Only about 2 percent of the total indicated nitrogen loss was leached out of the bottom of the 4 foot soil profile. (Cartmell-East Central Oklahoma State)
W76-00425

PRINCIPLES OF NUTRIENT CONTROL FOR AGRICULTURAL WASTEWATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
R. C. Loehr.
Presented at Second National Symposium on Food Processing Wastes, Denver, Colorado, March 23-26, 1971, p 605-615. 13 ref.

Descriptors: *Nutrients, *Control, *Wastewater(Pollution), Agriculture, Water pollution sources, Recycling, Eutrophication, Nitrates, Separation techniques, Groundwater.
Identifiers: *Land disposal.

Control of nutrients in agricultural discharges will become important in the near future as the nation's water resource policies receive greater scrutiny. Better data is needed concerning nutrient concentrations being discharged and processes that can be utilized for their control. Then technical decisions and cost estimates can be made. Among pollutant sources of concern are fruit and vegetable processing wastes; meat, poultry, and

fish processing wastes, and animal manures. Pollution problems caused by nutrients in wastewater discharges include: (1) additional oxygen demand caused by reduced nitrogen compounds, (2) stimulation of aquatic plant growth caused by nitrogen, phosphorus, and other nutrients in wastewater, and (3) excess nitrates in groundwater as a result of wastes discharged on land. The two most feasible approaches for nutrient control are separation at the source, recovery, and recycle and land disposal. The success of recovery and recycle depends upon the use of the product; success of land disposal depends upon better knowledge of the land as a disposal media. (Merryman-East Central Oklahoma State)
W76-00431

HYDROLOGY AND CHARACTERISTICS OF FEEDLOT RUNOFF,
Agricultural Research Service, Lincoln, Nebr.
N. P. Swanson.
In: Control of Agriculture-related Pollution in the Great Plains, Seminar, Lincoln, Nebraska, July 24-25, 1972, p 71-80. 2 fig, 12 ref.

Descriptors: Hydrology, *Feed lots, *Agricultural runoff, *Soil profiles, Topography, Meteorology, Infiltration rates, Phosphorus, Ammonia, Watersheds(Basins), Climate, Runoff, *Nebraska, Farm wastes.

A potential hydrologic pollution problem of runoff from 51,000 acres of Great Plains' feedlots existed in January of 1971. Rate of delivery of such runoff to streams is related to topographic, meteorological, and hydraulic characteristics in the feedlot area. Study of the agricultural runoff in Nebraska yielded the following hydrologic generalizations: (1) infiltration of pollutants into the soil profile is insignificant or very slow once a manure pack is formed, (2) a local problem of underground water pollution exists, (3) one inch rainfall may be absorbed by the soil manure mixture without runoff, (4) solids losses may be less from a feedlot than from tilled bare soil but moderate rainfall increases initiate much higher solids loss and COD value per unit volume of runoff, (5) rainfall intensity and solids removal directly influence phosphorus removal, (6) ammonia-N and NH3-N contents decrease with continuing precipitation, (7) snowmelt runoff contains more solids than rainfall runoff, (8) following a rainfall, feedlot runoff will start sooner, last longer, contain many more times the P, NH4-N content, and require less time to reach the point of discharge than the discharge from adjacent croplands, and (9) ordinarily it is not necessary to design runoff control facilities for the maximum possible precipitation. The location of a feedlot within a watershed in relation to fish populations, livestock water sources, and similar resources is most important. (Battles-East Central Oklahoma State)
W76-00435

EUTROPHICATION IN THE GREAT PLAINS,
Oklahoma Cooperative Fishery Unit, Stillwater.
R. C. Summerfelt.
In: Control of Agriculture-related Pollution in the Great Plains, Seminar, Lincoln, Nebraska, July 24-25, 1972, p 97-118. 5 tab, 42 ref.

Descriptors: *Eutrophication, *Great Plains, *Water pollution sources, *Fertilizers, *Feed lots, Nutrients, Irrigation, Agricultural runoff, Effluent, Discharge(Water), Drying, Incineration, Fish kills, Waste disposal, Water pollution effects, Waste water treatment.
Identifiers: *Winterkills, Pit disposal, Land disposal.

In the Great Plains area of the United States, an increasing amount of fertilizer has been applied to croplands since 1950. Simultaneously, the percentage composition of nitrogen, phosphorus, and potassium in fertilizers has increased as has the method of irrigation, thus enriching the water systems and causing eutrophication and winterkills. Increased use of commercial fertilizer in this area between 1955 and 1969 has increased N, P, and K concentrations in water systems above the minimum critical level. Eutrophication and winterkills in the North Central States and nitrate nitrogen levels of 55 to 60 percent entering Decator Lake, Illinois originated from fertilizers. Runoff from feedlot production in Kansas accounted for 5 to 27 reported fish kills during 1964. This population could have been controlled by use of (1) direct pit disposal of solids, (2) aerobic decomposition followed by either land disposal or drying and incineration or (3) proper location of the feedlot. Environmental standards, public demand for cleanup, and national policy are all burdening the discharger to prove that the effluent is innocuous. State water quality standards require treatment and control of animal feedlot discharge, but advancements in prevention of eutrophication are dependent upon the extra costs involved. (Battles-East Central Oklahoma State)
W76-00437

URINARY EXCRETION OF QUINALDINE BY CHANNEL CATFISH,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 5C.
W76-00439

SEALING OF ANAEROBIC DAIRY WASTE LAGOONS IN SANDY, HIGH WATER TABLE SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
C. G. Osterberg.
MS Thesis, 1972, 75 p. 20 fig, 20 tab, 14 ref.

Descriptors: *Soils, *Florida, *Dairy industry, Waste water treatment, Sampling, Analysis, Seepage, Flow rates, Sands, Groundwater, Nutrients, Anaerobic conditions, Microbiology, Farm wastes.
Identifiers: *Sealing, *Anaerobic lagoons, Loading rates, Hydraulic head.

A study was done to investigate the physical and biological sealing mechanisms of anaerobic dairy wastewater ponded over a highly permeable Florida fine sand. The effects of hydraulic head, manure loading rate and inhibited microbial activity were studied. Graphic analysis showed that the column receiving manure experienced a rapid reduction of flow rate to approximately 45 percent of the initial flow for the low loading rate and to 12 percent of the initial flow for the higher loading rates. After 113 days of manure loading, flow rate returned to 50 percent of the initial value for the low loading rate and to 30 percent for the higher rates. Little effect of hydraulic head on flow rate could be detected in the 15 cm. to 60 cm. range studied. The ultimate degree of soil sealing appears to depend on manure loading rate, although further long term testing is needed to determine if the ultimate sealing is related to the rapid sealing trend observed after several days of manure loading. (Cameron-East Central Oklahoma State)
W76-00445

TEST WAYS TO REDUCE FEEDLOT POLLUTION.
For primary bibliographic entry see Field 5G.
W76-00461

BRAKING FEEDLOT RUNOFF.
For primary bibliographic entry see Field 5G.
W76-00462

MICHIGAN'S ENVIRONMENTAL CONTROL PROGRAM AND ORGANIZATION,
Michigan Dept. of Natural Resources, Lansing. Environmental Protection Services.
For primary bibliographic entry see Field 5G.
W76-00471

NPDES PERMIT SYSTEM AND GUIDELINES FOR MICHIGAN PRESENTED AT THE AGRICULTURAL WASTE CONFERENCE, MICHIGAN STATE UNIVERSITY,
Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.
T. L. Kamppinen.
In: Agricultural Waste Conference Emphasis-Animal Waste, Kellogg Center, Michigan State University, East Lansing, May 22-23, 1974. p 67-69.

Descriptors: *Permits, *Water pollution control, *Feedlots, *Confinement pens, Livestock, *Water Quality Act.
Identifiers: Waste discharge permits.

On October 18, 1972, Congress pass Act 92-500 known as the Federal Water Quality Act Amendments of 1972. This Act was passed over a presidential veto. Section 402 established the National Pollutant Discharge Elimination System Permit Program. The Act required all point source dischargers to obtain a NPDES Permit by not later than December, 1974. The guidelines defined the term feedlot as a confined animal or poultry growing operation where crop or forage growth or production is not sustained in the area of confinement. To be recognized as a feedlot, the feedlot must meet one of the following criteria: (a) 1000 slaughter steers and heifers, (b) 700 dairy cattle, (c) 2500 swine over 55 lbs., (d) 10,000 sheep, (e) 55,000 turkeys, (f) 100,000 laying hens or broilers, (g) operations with unlimited continuous flow watering system, or (h) 1000 animal units from a combination of cattle, swine, or sheep. Michigan's requirements for filing of permit applications are discussed. (Cartmell-East Central Oklahoma State)
W76-00473

ANIMAL WASTE IMPACT ON RECREATION WATERS,
Michigan Dept. of Natural Resources, Lansing. Water Quality Appraisal Section.
R. Waybrant.
In: Agricultural Waste Conference Emphasis-Animal Waste, Kellogg Center, Michigan State University, East Lansing, May 22-23, 1974, p 107-108.

Descriptors: *Water pollution, *Recreation, *Farm wastes, Water quality, Water pollution effects.

The impact of animal waste on the quality of recreational surface waters will depend upon the constituents of the animal waste and the character of the receiving water. The general recreational aspects including swimming, fishing, and boating, are considered in this presentation along with the known changes or impact that individual constituents of animal waste will cause in a given situation. (Cartmell-East Central Oklahoma State)
W76-00475

CONCENTRATIONS AND CYCLES OF BACTERIAL INDICATORS IN FARM SURFACE RUNOFF,
S. H. Kunkle.
In: Relationship of Agriculture to Soil and Water Pollution, Cornell University Conference on Agricultural Waste Management, Rochester, New York, 1970, p 49-60, 7 fig, 2 tab, 27 ref.

Descriptors: *Water pollution, *Agricultural runoff, *Coliforms, *Farm wastes, Bioindicators, *Vermont.
Identifiers: *Bacterial indicators, Feces, Sleepers River watershed(Vt).

Adequate surveillance techniques for detecting animal waste contamination of streams are essen-

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tial if water pollution is to be avoided. This report describes initial results from a study of bacterial pollution indicators on the Sleepers River Watershed, Danville, Vermont. During periods of storm runoff from the water shed concentration of total and fecal coliforms rose drastically, with distribution of the values closely related to the hydrograph. Total coliform concentrations in runoff from the hayfield (unsubjected to farm animal wastes) were similar to concentration in runoff from the partially grazed 0.75 sq km watershed, making use of total coliform data of questionable value for pollution surveillance within the rural watershed. To the contrary, the fecal coliform densities were much greater in the partially grazed watershed's runoff than in the hayfield's. Evidently the more specific coliform group is a much better pollution indicator for the conditions of the study. The percentage of total coliforms that were fecal types were much higher in the watershed runoff than in the hayfield runoff. This study emphasizes that the hydrologic processes are of extreme importance in reference to use of indicator organisms. These hydrologic and physical relationships need to be well described if water quality inputs in streams are to be successfully modeled. (Cartmell-East Central Oklahoma State)
W76-00483

DUMPS: A POTENTIAL THREAT TO GROUND WATER SUPPLIES,
Environmental Protection Agency, Washington, D.C. Office of Solid Waste Management Programs.
B. Neddle, and G. Garland.
Water Well Journal, Vol 24, No 1, p 83-87, January, 1975. 2 fig, 1 tab, 10 ref.

Descriptors: *Waste disposal, *Landfills, *Waste dumps, *Solid wastes, *Water pollution sources, Land use, Planning, Sites.
Identifiers: Site selection, Land use planning.

The production of leachate is a complex process involving many variables. Leachate is formed when water percolating through solid waste flushes out compounds and other processes of decomposition. Rain falling over a disposal site will partially infiltrate and partially run off the surface. A portion of that water which infiltrates will be used to meet the demands for evaporation and the remainder will percolate down through the soil into the buried solid waste. Initially, the solid waste acts as a sponge and simply absorbs the water. However, with continued water addition, the waste eventually reaches the limit of its moisture retaining capacity. At this point, any further water entering the waste will cause an equal volume of leachate to leave the waste. The process is greatly accelerate at open dumps where soil cover is not provided, because run off is greatly reduced, thereby increasing infiltration and leachate production. Liquid waste disposal contributes to the water going through the system as well as waters from adjacent areas and ground water moving through the waste. (Bradbeer-NWWA)
W76-00487

5C. Effects Of Pollution

INFLUENCE OF EFFLUENTS OF SULFITE CELLULOSE FACTORY ON ALGAE IN CULTURES AND RECEIVING WATERS,
Jyvaskyla Univ. (Finland). Dept. of Biology.
V. Eloranta, and P. Eloranta.
Vatten, Vol 30, No 1, p 36-48, 1974. 14 fig, 22 ref, 2 tab.

Descriptors: *Sulfite liquors, *Algae, *Pulp wastes, *Water pollution effects, *Bleaching wastes, Wastes, Industrial wastes, Water pollution sources, Toxicity, Acidity, Foreign countries, Europe, Bioassay, Cultures, Phosphorus, Effluents, Phosphorus compounds.
Identifiers: Finland, Spent sulfite liquor, Sulfite pulp mills, Woodroom effluents.

A modified bioassay method was used to study the effect of effluents from the Mantta sulfite pulp mill of G. A. Serlachius Oy. (Finland) on the growth of pure cultures of Ankistrodesmus falcatus. The effluents were taken from the main lake outfalls discharging the wastes of the barking plant (whoodroom), pulp mill, and bleach plant; and from separate processes from the pulp mill (spent cooking liquor and wash water) and the bleach plant (chlorination and alkali stage effluents). The effluents with the highest toxic and inhibitory effects included the spent cooking liquor and wash water and effluents from the main discharge conduit. Their toxicity is probably due to their acidity and the growth-inhibiting effect is presumably attributable to sulfur compounds. The effluent from the main discharge conduit also had a growth-stimulating effect, especially at concentration of 5-10%, after the initial inhibition had ceased. Woodroom and bleach plant effluents had little deleterious effects on algal growth. Woodroom effluent promoted algal growth due to its high phosphorus content. At their highest concentrations, the effluents sharply decreased the number of species and the total biomass. (Witt-IPC)
W76-00045

RECIPIENT INVESTIGATION IN THE LAKE GLAFSFJORDEN,
G. Nylander.
Vatten, No 2, p 109-116, 1973. 3 fig, 3 tab.

Descriptors: *Lakes, *Water quality, *Pollution abatement, *Pulp wastes, Hydrogen ion concentration, Color, Chemical oxygen demand, Biochemical oxygen demand, Oxygen, Phosphorus, Fibers(Plant), Sulfite liquors, Water pollution sources, Industrial wastes, Dissolved oxygen, Water pollution effects, Cellulose.
Identifiers: *Lake Glafsfjorden(Sweden), Sulfite pulp mills.

A comparison of the water samplings performed in 1967 and 1971 showed that great improvements have occurred in Lake Glafsfjorden (Sweden) since the effluent from a sulfite pulp mill was stopped in 1969. Improvements in pH, color, COD, BOD oxygen, and phosphorus content in the water layer near the bottom are reported. Cellulose fibers have been almost totally eliminated, and the presence of chironomidae indicates an improvement of oxygen conditions near the bottom. (Buchanan-IPC)
W76-00058

DISCUSSION (OF, 'INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS OF THE GREAT LAKES' BY L. T. CROOK),
State Univ. of New York at Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2H.
W76-00068

DISCUSSION (OF, 'INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS OF THE GREAT LAKES,' BY L.T. CROOK),
Resource Management Associates, Lafayette, Calif.
For primary bibliographic entry see Field 2H.
W76-00069

NUTRIENT INPUTS TO A LAKE AND THEIR EFFECTS UPON WATER QUALITY,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
D. B. Aulenbach, and N. L. Clesceri.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 11-38. 3 fig, 13 ref, 2 tab.

Descriptors: *Nutrients, *Lakes, *Water quality, Lake basins, Watersheds(Basins), Water, Precipitation(Atmospheric), Surface runoff, Groundwater, Shores, Water levels, Waste water(Pollution), Phosphorus, Nitrogen, Water quality standards, Water quality control, Water pollution sources, Human population, *New York.
Identifiers: *Lake George(New York)

The components of a lake system (water, basin, and watershed) and the manner in which each can affect the quality of water within a lake are described. Major and minor elements required to support biological life are identified and the contribution of nutrients to a lake by precipitation, surface runoff, groundwater, human development and activity, physical changes in the lake (e.g. water level, shoreline, dredging, and filling), and waste discharges are discussed. U.S. Environmental Protection Agency standards for phosphorus and nitrogen contents of lakes are reviewed, and the results of a study of the annual nitrogen and phosphorus sources and sinks in Lake George, New York, are presented and discussed. (See also W76-00102) (Witt-IPC)
W76-00104

A STUDY OF THE EFFECTS OF THE SAN FRANCISCO OIL SPILL ON MARINE LIFE PART II: RECRUITMENT,
College of Marin, Kentfield, Calif.
G. L. Chan.
In: 1975 Conference on Prevention and Control of Oil Pollution3 proceedings, p 457-461, March 1975. 9 fig, 6 ref.

Descriptors: *Oil spills, *Oil pollution, *Invertebrates, *Fuels, Crabs, Clams, Mussels, Sampling, Water pollution effects, Environmental effects, *California.
Identifiers: *Bunker C fuel, *Barnacles, Recolonization, Transects, Sea anemones, Balanus glandula, Chthamalus dalli, Pollicipes polymerus, *San Francisco Bay.

A study of marine organisms on intertidal transects was made to observe the effects of the San Francisco Bunker C oil spill of January 18, 1971. From a comparison of pre-oil and post-oil transect data, it was estimated that 4.2 to 7.5 million marine invertebrates, chiefly barnacles (Balanus glandula, Chthamalus dalli, and Pollicipes polymerus) were smothered by the oil. Other invertebrates included sea anemone, crabs, chiton, sea mussel and boring clam. In subsequent observations from 1972 to 1974, the sample counts of invertebrates had returned to, and in some cases surpassed pre-oil transect levels. No lingering effects of the oil spill were noted in any of the marine species. (Katz)
W76-00135

PRELIMINARY OBSERVATIONS ON THE MODE OF ACCUMULATION OF NO. 2 FUEL OIL BY THE SOFT SHELL CLAM, MYA ARENARIA,
Rutgers-The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
D. M. Stainken.
In: 1975 Conference on Prevention and Control of Oil Pollution: Proceedings; p 463-468, March 1975. 3 fig, 3 tab, 36 ref.

Descriptors: *Mollusks, *Clams, *Oil pollution sources, *Animal physiology, *Fuels, Tracers, Laboratory tests, Path of pollutants, Analytic techniques, Environmental effects, Water pollution effects.
Identifiers: *Fuel oil (No2), Mya arenaria, Bioaccumulation, Tissue analysis.

Young Mya arenaria were exposed to 50ppm, 100ppm, and 150ppm concentrations of emulsified No 2 fuel oil and an oil soluble dye in seawater at 5 and 22 degrees C. The clams treat oil micelles as globules as food or detritus particles. The smaller

oil micelles were passed by direct ciliary currents o the stomach. Larger globules were bound by nucus secreted by the gill ctenidia. Gas chro- natography and mass spectro- metry confirmed he binding of oil-mucus. The oil-mucus was in- ested or rejected by means of the clam ciliary athways. Environmental implications were iscussed. (Katz)
W76-00136

ACCUMULATION, RELEASE, AND DISTRIBU- TION OF BENZO (A) PYRENE -C14 IN THE CLAM, RANGIA CUNEATA,
Texas A and M Univ., College Station. Dept. of Biology.
. M. Neff, and J. W. Anderson.
n: 1975 Conference of Prevention and Control of Oil Pollution:Proceedings, March 1975, p 469-471, tab, 15 ref.

Descriptors: *Mollusks, *Clams, *Animal physiology, *Oil pollution, *Organic compounds, Tracers, Analytical techniques, Laboratory tests, Toxicity, Path of pollutants, Environmental ef- ects, Water pollution effects.
Identifiers: Rangia cuneata, *Benzo (a) pyrene- C14, Bioaccumulation, Tissue analysis.

Groups of estuarine clams, Rangia cuneata, were xposed for 24 hours to synthetic seawater con- aining in solution 0.0305 ppm benzo (a) pyrene - C14. In two experimental exposures, average total oncentrations of benzo (a) pyrene (BAP) in the lam tissues were 7.2 ppm and 5.7 ppm, approxi- nately 200 times the ambient level. The majority f the radioactivity was localized in the viscera vhich contains the digestive system, gonads and eart. The other tissues analyzed, the mantle, gills, dductor muscle, and foot, each contained 3-16% f the radioactivity. Whe returned to isotope-free eawater, the clams immediately began to release he accumulated BAP. After 30 days only 0.07 ppm BAP remained in the tissues. BAP could not be de- ected (limits of detection, 0.01 ppm) in clams naintained in isotope-free seawater for 58 days. During depuration, the distribution of radioactivi- y in the tissues remained relatively constant. The iscera contained most of the activity at all sam- ling times. (Katz)
W76-00137

MORPHOLOGICAL ANOMALIES IN ADULT OYSTERS, SCALLOP, AND ATLANTIC SIL- VERSIDES EXPOSED TO WASTE MOTOR OIL,
Environmental Protection Agency, National Marine Water Quality Lab., West Kingston, R.I.
G. R. Gardner, P. P. Yevich, and P. F. Rogerson.
n: 1975 Conference on Prevention and Control of Oil Pollution; Proceedings, p 473-477, March 1975. fig, 1 tab, 15 ref.

Descriptors: *Oil pollution, Aquatic animals, Atlantic silversides, *Mollusks, Animal physiolo- y, *Oil wastes, Path of pollutants, Toxicity, En- ironmental effects, Chemical analysis, Lethal mit, *Oyster, Bioindicator.
dentifiers: *Scallops, *Waste motor oil, LC-50, Tissue analysis, Bioaccumulation, Menidia enidia, Aquipectins irradians, Crassostrea vir- inica.

Waste motor oil concentration of 20 ppm and igher induced lesions in the vascular systems of tlantic silversides, Menidia menidia, and oysters, Crassostrea virginica. The lesions were associated vith the pseudobranch, the heart, and the arterial ystem of the silversides, and the branchial ef- erent vein of the oyster. Lesions occurred in the astro-intestinal tract of the oyster, and gill and idney of scallop, Aquipectins irradians, and the antle of both species. The scallop demonstrated he highest sensitivity to the toxic effects for eriods up to 60 days. The highest sensitivity to he toxic effects for periods up to 60 days. The C-50 (96-hr) value for waste motor oil and adult tlantic silversides was 1,700 ppm. Acute toxicity values were not determined for the oyster or scal- lop. (Katz)
W76-00138

LONG-TERM CHEMICAL AND BIOLOGICAL EFFECTS OF A PERSISTENT OIL SPILL FOL- LOWING THE GROUNDING OF THE GENERAL M. C. MEIGS,
National Marine Fisheries Service, Seattle, Wash.
R. C. Clark, Jr., J. S. Finley, D. G. Patten, and E. E. DeNike.
In: 1975 Conference on Prevention and Control of Oil Pollution; Proceedings, p 479-487, March 1975. 8 fig, 4 tab, 6 ref.

Descriptors: *Oil spills, *Oil pollution, *Intertidal areas, Analytical techniques, Organic compounds, Path of pollutants, Environmental effects, Inver- tebrates, Algae, Aquatic plants, Crabs, Popula- tion, Persistence, *Washington, Water pollution effects.
Identifiers: Long-Term effects, Sea urchins, Recolonization, Anemones, Urchins, Bioaccumu- lation, *Cape flattery(Wash).

Petroleum hydrocarbon uptake patterns and ob- servations of plant and animal populations of an intertidal community exposed continually since January 1972 to small quantities of a Navy Special Fuel Oil residue from the grounded unmanned troopship General M. C. Meigs were obtained by an interagency team of oceanographers, biolo- gists, chemists and engineers. Although the tar- ball-like character of the released oil served to limit its coverage, specific members of the inter- tidal community showed effects of the persistence of the spill. Long-term observations and analyses made since the grounding of the 622-foot military transport on a rich and productive intertidal regime are described. (Katz)
W76-00139

OIL POLLUTION STUDIES ON LAKE MARACAIBO, VENEZUELA,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 5A.
W76-00140

THE EFFECT OF PRUDHOE BAY CRUDE OIL ON SURVIVAL AND GROWTH OF EGGS, ALEVINS, AND FRY OF PINK SALMON, ON- CORHYNCHUS GORBUSCHA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab.
S. D. Rice, D. A. Moles, and J. W. Short.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 503-507, March 1975. 2 fig, 4 tab, 19 ref.

Descriptors: *Salmonids, *Pink salmon, *Toxicity, *Oil wastes, *Oil pollution, *Growth stages, *Resistance, Fish eggs, Fry, Freshwater, Saline water, Organic compounds, Laboratory tests, Water pollution effects, *Bioassay.
Identifiers: Oncorhynchus gorbuscha, *Prudhoe Bay Crude Oil, TLM, Alevins, Sublethal effects.

Standard 96-hour bioassays with 'total' oil solu- tions in freshwater and seawater determined dif- ferences in sensitivity of the developing life stages of pink salmon, Oncorhynchus gorbuscha. Eggs were the most resistant and emergent fry (yolk sac absorbed) the most sensitive to acute 4-day expo- sures. Susceptibility was greater in seawater after fry migration. (Katz)
W76-00141

EXPERIMENTAL CRUDE OIL SPILLS ON A SMALL SUBARCTIC LAKE IN THE MACKEN- ZIE VALLEY, N.W.T.: EFFECTS ON PHYTOPLANKTON, PERIPHYTON, AND AT- TACHED AQUATIC VEGETATION,
Toronto Univ., (Ontario). Dept. of Botany.
J. A. Hellebust, B. Hanna, R. G. Sheath, M. Gergis, and T. C. Hutchinson.
In: 1975 Conference on the Prevention and Con- trol of Oil Pollution:Proceedings, p 509-515, March 1975. 7 fig, 2 tab, 9 ref.

Descriptors: *Oil spills, *Oil pollution, *Limnology, *Lakes, *Phytoplankton, *Periphyton, *Vegetation, Environmental effects, Laboratory studies, On-site tests, Cyanophyta, Methodology, Biomass, Succession, Population, *Canada, Water pollution effects.
Identifiers: Experimental oil spills, Subarctic lakes, *Crude oil, *Macrophytes, Oscillatoria an- gustissima, Mackenzie Valley(NWT).

Experimental crude oil spills were made in 3-m2 cylinders in open water, and in submerged moss, horsetail, and sedge communities of a small sub- arctic lake in the Mackenzie Valley, near Norman Wells, N.W.T. Studies were made of the effects of crude oil on phytoplankton, periphyton, and at- tached macrophytes in terms of population com- position, seasonal succession, and biomass. The presence of crude oil (15 liters m-2) had no signifi- cant effects on phytoplankton composition or abundance throughout the growth season but had a marked inhibitory effect on most members of the periphyton. One notable exception to this observa- tion was a considerable growth stimulation of the blue-green alga Oscillatoria angustissima. (Katz)
W76-00142

PETROLEUM HYDROCARBONS AND OYSTER RESOURCES OF GALVESTON BAY, TEXAS,
Virginia Inst. of Marine Science, Gloucester Point.
R. D. Anderson.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 541-548, March 1975. 2 fig, 5 tab, 30 ref.

Descriptors: *Organic compounds, *Oil wastes, *Oil pollution, *Oysters, Resistance, Toxicity, Animal physiology, Oil industry, Path of pollu- tants, Shellfish, Environmental effects, Analytical techniques, *Texas, Bays, Absorption, Water pol- lution effects.
Identifiers: *Tissue analysis, Crassostrea vir- ginica, Depuration, Sublethal effects, No. 2 fuel oil, Galveston Bay(Tex).

Field and laboratory studies of petroleum hydrocarbons in the tissues of the American oyster, Crassostrea virginica, were conducted from 1971 to 1974. Analysis of tissues revealed sig- nificant amounts of oil-derived petroleum hydrocarbons from oysters collected in areas near petrochemical industries. Lower values were found in meats from oysters collected at natural and artificial reefs. Uptake and depuration of petroleum hydrocarbons were determined. In oil- free seawater, oysters released saturated chains and most aromatic fractions rapidly with depura- tion to below detectable levels taking place within 52 days. (Katz)
W76-00143

FATE OF PETROLEUM HYDROCARBONS IN MARINE ZOOPLANKTON,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. F. Lee.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 549-553, March 1975. 1 fig, 9 tab, 17 ref.

Descriptors: *Oil wastes, *Oil pollution, *Zooplankton, *Copepods, Organic compounds, Animal physiology, Water quality, Jellyfish, Am- phipoda, Toxicity, Sampling, Tracers, *Absorption, *Metabolism.
Identifiers: Tissue analysis, Bioaccumulation, Euphausiids, Ctenophores, Crab zoea, 3H-benz- pyrene, 14C-benzpyrene, 3H-methylcholanthrene, 14C-napthaline, Chemical discharge.

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The uptake, metabolism, storage and discharge of petroleum hydrocarbons by marine zooplankton were discussed in light of the marine food web. Both paraffinic and polycyclic aromatic hydrocarbons were added to seawater containing various species of zooplankton - copepods, euphausiids, amphipods, crab zoea, ctenophores and jellyfish - collected off California, British Columbia and in the Arctic. Hydrocarbons found included 3H-benzpyrene, 14C-benzyprene, 3H-methylcholanthrene, and 14C-napthalene. (Katz)
W76-00144

LONG-TERM EFFECTS OF AN OIL SPILL AT WEST FALMOUTH, MASSACHUSETTS,
Marine Biological Lab., Woods Hole, Mass.
A. D. Michael, C. R. Van Raalte, and L. S. Brown.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 573-582, March 1975. 19 fig, 16 tab, 8 ref.

Descriptors: *Oil pollution, *Oil spills, *Speciation, *Benthic fauna, Sediments, Succession, Fuels, Gas chromatography, Analytical techniques, Density, Distribution patterns, Environmental effects, Sampling, *Massachusetts, Pollutant identification, Water pollution effects.
Identifiers: Long-term effects, Opportunistic species, Hydrocarbon analysis, West Falmouth(Mass).

A small spill of No. 2 fuel oil occurred near Wild Harbor, Massachusetts, in September 1969. The benthic fauna of the Wild Harbor Marsh, boat basin, and offshore area was sampled through the fourth and fifth years after the spill (1973,1974). Sediment samples were analyzed for the presence of petroleum hydrocarbons. Gas chromatography produced evidence of hydrocarbons typical of weathered fuel oil in the sediments of the marsh, boat basin, and two offshore stations. The numbers of benthic species at the offshore stations and the marsh were slightly, but significantly, lower than those found at control stations. Population densities were similar to control areas for the offshore stations but not in the case of the marsh. The boat basin was still heavily affected. Some stations were characterized by the presence of opportunistic species. The recovery process in terms of the total benthos has leveled off, but there was evidence for further recovery during the course of the study. (Katz)
W76-00146

BOONE CREEK OIL SPILL,
Environmental Protection Agency, Edison, N.J. Surveillance and Analysis Div.
D. Schultz, and L. B. Tebo, Jr.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 583-588, March 1975. 4 fig, 1 tab, 11 ref.

Descriptors: *Fuels, *Oil pollution, *Organic compounds, *Oil spills, *Invertebrates, *Periphyton, *Sediments, *Fish, Data collections, Sampling, Succession, Population, Environmental effects, Speciation, *South Carolina, Water pollution effects.
Identifiers: *Diesel fuel, Biological surveys, *Bone Creek(SC).

A biological survey was conducted on the effects of a 7,000 gallon diesel fuel spill into Boone Creek, South Carolina. Macroinvertebrate organisms, periphyton, and fish were collected, preserved, identified and enumerated. Sediments were analyzed for hydrocarbon content. Locations downstream from the oil spill contained reduced numbers and types of organisms. 90% of the fish community was killed during the initial oil spill. Periphyton growths, dominated by diatoms, increased at locations downstream during early summer. Analysis of substrate sediment samples revealed hydrocarbons still present in Boone Creek 13 months after the spill occurred. (Katz)
W76-00147

FATE AND EFFECTS OF CRUDE OIL ON AN ESTUARINE POND,
Gulf Coast Research Lab., Ocean Springs, Miss.
J. S. Lytle.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 595-600, March 1975. 7 fig, 3 tab, 11 ref. EPA 68-01-0745.

Descriptors: *Ponds, *Limnology, *Estuaries, *Oil pollution, *Speciation, *Fish populations, *Plankton, Zooplankton, Phytoplanktons, Water quality, Sediments, Environmental effects, Fauna, Primary producers, Gas chromatography, Toxicity, Oil spills, Water pollution effects.
Identifiers: *Crude oil, Long-term effects.

Crude oil spilled in an estuarine marine environment caused short term, acute effects on salt marsh plants. Drastic changes in both diversity and numbers in the fish population were observed immediately after the spill. Initially zooplankton populations dropped, accompanied by phytoplankton blooms. As the oil dissipated, the zooplankton population increased rapidly. Long-term effects on fauna and flora were being studied. Migration of the oil via benthic animals and tidal percolations was observed as much as 42cm beneath the sediment surface. The sediments acted as an organic sink preserving the crude oil. Gas chromatographic analyses of sediment core sections indicate slow degradation of the crude oil with loss only of the lower molecular weight hydrocarbons after twelve months. (Katz)
W76-00148

AN EXPERIMENTAL OIL SPILL: THE DISTRIBUTION OF AROMATIC HYDROCARBONS IN THE WATER, SEDIMENT, AND ANIMAL TISSUES WITHIN A SHRIMP POND,
Texas Agricultural Extension Service, College Station.
B. A. Cox, J. W. Anderson, and J. C. Parker.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 607-612, March 1975. 4 fig, 4 tab, 15 ref.

Descriptors: *Oil spills, *Oil pollution, *Organic compounds, *Fuels, *Invertebrates, *Shrimp, *Clams, *Oysters, Commercial shellfish, Mortality, Toxicity, Water pollution effects.
Identifiers: Experimental oil spills, Fuel oil(No. 2), *Napthalenes, Tissue analysis, Penaeus setiferus, Crassostrea virginica, Rangia cuneata.

In an experimental oil spill study No. 2 fuel oil was utilized in higher quantity than normal on a shrimp pond and the residue was not removed. Mortalities of juvenile shrimp, Penaeus setiferus, and other invertebrates were recorded for 96 hours. A peak in the level of mortality occurred 48 hours after the spill, coinciding with the peak in the concentration of napthalenes in the tissues of caged and free swimming organisms. Napthalene levels were also measured in clams, Rangia cuneata and oysters, Crassostrea virginica. (Katz)
W76-00149

SEWAGE TREATMENT AND DISCHARGE INTO TROPICAL COASTAL WATERS,
University of the South Pacific, Suva (Fiji). School of Natural Resources.
For primary bibliographic entry see Field 5E.
W76-00259

EFFECT OF CESSPOOL DISCHARGE ON GROUND-WATER QUALITY ON LONG ISLAND, N.Y.,
Nassau County Health Dept. Mineola, N.Y. Environmental Conservation Programs.
For primary bibliographic entry see Field 5B.
W76-00308

ACCUMULATION AND ELIMINATING STUDIES OF FOUR DETERGENT FLUORESCENT WHITENING AGENTS IN BLUEGIL (LEPOMIS MACROCHITUS),
CIBA-GEIGY Corp., Greensboro, N.C. Dye-stu and Chemicals Div
For primary bibliographic entry see Field 5A.
W76-00318

EVALUATION OF SOME METHODS OF ANA YSIS FOR PETROLEUM HYDROCARBONS MARINE ORGANISMS,
Woods Hole Oceanographic Institution. Ma Dept. of Chemistry.
For primary bibliographic entry see Field 5A
W76-00320

AN ESTUARINE LOW-TEMPERATURE FIS KILL IN MISSISSIPPI, WITH REMARKS RESTRICTED NECROPSIES,
Gulf Coast Research Lab., Ocean Springs, Miss
R. M. Overstreet.
Available from the National Technical Inform tion Service, Springfield, Va. 22161 as COM-10306, $3.25 in paper copy, $2.25 in microfic Gulf Research Reports, Vol 4, No 3, p 328-3 1974. 19 fig, 3 tab, 62 ref.

Descriptors: *Fishkill, *Stress, *Temperatu *Mullet, *Saline water, *Thermal stre *Freezing, Pesticide residues, Mortality, F physiology, Freshwater fish, *Mississippi, Est ries, Microscopy, Analytical techniques, W pollution effects.
Identifiers: Mugil cephalus, Tissue analy Osmoregulation, Bayous, Thermal acclimation

In January 1973, large numbers of striped mu (Mugil cephalus), weighing approximately grams each, died in two freshwater localitie tidewater bayous in Mississippi. Fish of sev other species were found dead in other low sa estuarine areas. This particular incident is tributed to conditions of stress for fish incompl ly acclimated to the low temperatures that curred. The most deleterious stress was the saline water which probably allowed a breakd in the fishes' ion-osmoregulatory mechanis Striped mullet and other euryhaline fishes in sa ties greater than 6 ppt survived, as did freshw centrarchids and ictalurids in areas with d mullet. Starvation and high levels of pesti residues were also sources of stress during period of rapidly decreasing temperatures. (Ka W76-00321

EFFECTS OF PROPYLENE OXIDE SELECTED SPECIES OF FISHES,
Air Force Armament Lab., Eglin AFB, Fla.
R. C. Crews.
Available from the National Technical Info tion Service, Springfield, Va 22161 as AD-637, $3.25 in paper copy, $2.25 in microfiche Force Systems Command, Final Re November 1974. 14 p, 3 fig, 3 tab.

Descriptors: *Bioassay, *Lethal limit, Labora tests, *Toxicity, *Toxicants, Pollutants, Aq life, *Environmental effects, Sunfishes, Mu Freshwater fish, Water pollution sources, W pollution effects.
Identifiers: *Propylene oxide, *Fuel air e sives.

In conjunction with the fuel air explosives te and evaluation program, laboratory investiga into the effects of propylene oxide were ac plished using two freshwater fishes and marine species. For a 96-hour exposure, the an tolerance limits for propylene oxide wer parts per million for mosquitofish (Gambus finis), 215 ppm for bluegill (Lepomis macroc and 89 ppm for common mullet (Mugil ceph The results demonstrate that the toxici propylene oxide is sufficiently high to wa caution with its handling near freshwater marine aquatic systems. (Katz)
W76-00322

SUBLETHAL EFFECTS OF OIL, HEAVY METALS AND PCB'S ON MARINE ORGANISMS,
Texas A and M Univ., College Station. Dept. of Biology.
J. W. Anderson, J. M. Neff, and S. R. Petrocelli.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 514, $3.75 in paper copy, $2.25 in microfiche. In: The Mechanisms of Survival in Toxic Environments, American Society of Zoologists, December 1973. Symposium Volume, Academic Press, 1974. 47 p, 7 tab, 10 fig, 41 ref.

Descriptors: *Hydrocarbons, *Reviews, *Heavy metals, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, Aquatic life, *Marine animals, Pollutants, *Growth rates, *Respiration, Iron, Manganese, Cobalt, Zinc, Mercury, Cadmium, Estuaries, Oil, Aroclor, Bioassay, Analytical techniques, Data collections, Lethal limit.
Identifiers: *Sublethal effects, Bioaccumulation, *Petroleum hydrocarbons, Chloride ion regulation.

This review described what has been and is now being done in the study of the sublethal effects of three major classes of pollutants commonly found in the estuarine environment. Heavy metals and chlorinated hydrocarbons are in general accumulated to a greater extent and bound to organisms much more firmly than petroleum hydrocarbons. Retention of petroleum derived hydrocarbons by animals may vary from several days to approximately two months and is species dependent. The class of petroleum hydrocarbons accumulated to the greates extent and retained the longest is the naphthalenes. Inorganic mercury, Aroclor 1254, and petroleum hydrocarbons affect the respiratory rate and chloride ion regulation of selected marine animals. There is some indication that the levels of petroleum hydrocarbons in the animal tissues may act to temporarily alter the regulatory ability of the test individuals. This interference was shown in several instances to the transitory, presumably due to the dynamics of hydrocarbon release from the tissues to the environment. (Katz)
W76-00324

PRELIMINARY ENVIRONMENTAL HAZARD ASSESSMENT OF CHLORINATED NAPHTHALENES, SILICONES, FLUOROCARBONS, BENZENEPOLYCARBOXYLATES, AND CHLOROPHENOLS,
Syracuse Univ. Research Corp., N.Y.
P. H. Howard, and P. R. Durkin.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 074, $8.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-560/1-74-001, November 1973. 263 p, 64 tab, 16 fig, 356 ref.

Descriptors: *Environmental effects, *Toxicity, *Phenols, *Organic compounds, *Lethal limits, Pollutants, Water pollution sources, Analytical techniques, Laboratory tests, Chemical properties, Hazards, Chlorination, Water pollution effects, *Reviews, *Bibliographies.
Identifiers: *Benzenepolycarboxylates, *Chlorophenols, *Chlorinated naphthalenes, *Silicones, *Fluorocarbons, Bioaccumulation, Halowax, Benzoic acids, Pthalic acids, Pyromellitic acids.

A review of five classes of chemical compounds covers production, environmental exposure, environmental effects, and toxicology. The classes are benzenepolycarboxylates (including phthalates), chlorinated naphthalenes, chlorophenols, silicones (siloxanes) and fluorocarbons (including chlorofluorocarbons). (Katz)
W76-00326

THE EFFECT OF PESTICIDES ON BYSSUS FORMATION IN THE COMMON MUSSEL, MYTILUS EDULIS,
Queens Univ., Belfast (Northern Ireland). Dept. of Zoology.
D. Roberts.
Environmental Pollution, Vol 8, No 4, p 241-254, June 1975. 5 fig, 3 tab, 18 ref.

Descriptors: *Mollusks, *Mussels, *Pesticides, *Organic compounds, *Bioindicators, Animal physiology, Growth stages, Toxicity, Water quality, *Polychlorinated biphenyls, *Pollutant identification.
Identifiers: *Scallops, *Endosulfan, Trichlorophon, *Byssys attachment, Mytilus edulis, Chlamys opercularis, Tissue analysis, Bioaccumulation.

Sea mussels (Mytilus edulis) were exposed to a range of pesticides and PCB's, several of which caused a reduction in byssal attachment at higher concentrations. In queen scallops (Chlamys opercularis) byssus formation was similarly affected. The sensitivity of mussels was greater at high temperatures and decreased with increase in size. Of the compounds tested, Endosulfan (organochlorine) was the most toxic, and Trichlorphon (organophosphate) was the least toxic. The probable cause of decreased byssal attachment was a reduction in pedal activity. It was suggested that byssogenesis tests offer a rapid and convenient technique for screening of potential marine pollutants. (Klein)
W76-00328

'MIGRATION' OF BLOWOUTS IN SEAGRASS BEDS AT BARBADOS AND CARRIACOU, WEST INDIES, AND ITS ECOLOGICAL AND GEOLOGICAL IMPLICATIONS,
Bellairs Research Inst., St. James (Barbados).
D. G. Patriquin.
Aquatic Botany, Vol 1, No 2, p 163-189, June 1975. 12 fig, 2 tab, 29 ref.

Descriptors: *Grasses, *Sediments, *Coasts, *Vegetation effects, Succession, Plant growth, Movement translocation, Environmental effects, *Migration, Soil erosion.
Identifiers: *Blowouts, *Seagrasses, Syringodium, Thalassia, *West Indies(Barbados-Carriacou).

Blowouts (grass-free depressions within seagrass beds) were described in detail. The seaward edges were steep and exposed rhizomes of Thalassia while the leeward edges sloped gently upward onto the seagrass plateau and were usually colonized by Syringodium. Evidence was given to suggest the migration of blowouts seaward. (Klein)
W76-00329

THE EFFECT OF THERMAL EFFLUENT UPON THE STANDING CROP OF AN EPIPHYTIC ALGAL COMMUNITY,
Alberta Univ., Edmonton. Dept. of Botany.
D. M. Klarer, and M. Hickman.
Internationale Revue der gesamten Hydrobiologie, Vol 60, No 1, p 17-62, 1975. 16 fig, 8 tab, 50 ref.

Descriptors: Effluents, *Bioindicators, *Ecosystems, *Algae, Heated water, *Thermal pollution, Biomass, Primary productivity, Water quality, *Standing crops, Diatoms, *Canada, Water pollution effects.
Identifiers: *Epiphyton, *Scirpus validus, *Fragilaria capucina, *Diatoma elongatum, *Lake Wabamum(Alberta).

Water temperature and dissolved oxygen levels varied while water chemistry remained unchanged at heated and non-heated sites in Lake Wabamum during an investigation of the epiphyton associated with Scirpus validus. Dissolved silica, nitrate-nitrogen, and phosphate-phosphorus levels varied with temperature and season. The epiphyton at all sites showed a spring maximum, a summer minimum, and an early autumn maximum. The spring dominants were Fragilaria capucina and Diatoma elongatum. The heated water caused a decrease in number of species and an increase in mean yearly standing crop size. (Klein)
W76-00330

EQUILIBRIUM AND STABILITY IN LABORATORY MODELS OF SEWAGE PONDS AND POLLUTED RIVERS,
Technische Universitat, Dresden (East Germany). Bereich Hydrobiologie.
D. Uhlmann, and F. Cramer.
Internationale Revue der gesamten Hydrobiologie, Vol 60, No 1, p 1-16, 1975. 13 fig, 2 tab, 21 ref.

Descriptors: *Ecosystems, *Primary productivity, *Laboratory tests, *Sewage, *Model studies, Environmental effects, Water quality, Nutrients, Food chains, Equilibrium, Stability, Phytoplankton, Zooplankton, Biomass, Water pollution effects, Water pollution sources.
Identifiers: *Simulated studies.

The ability of simple homogenous ecosystems with continuous or semicontinuous flow to respond to chemical and physical environmental changes was followed. Under constant environmental conditions the systems usually exhibited slow oscillations of the ecosystem parameters around an equilibrium state, (e.g. phytoplankton and zooplankton numbers). One mechanism suggested for functional stability was the inverse relationship between biomass and activity per unit biomass as observed in the laboratory models. The results were discussed with respect to short and long term effects of pollution abatement from flowing and standing waters. (Klein)
W76-00331

PCB CONTENTS IN SEVERAL SPECIES OF FLATFISH COLLECTED IN THE EASTERN BERING SEA, (IN JAPANESE),
Hokkaido Univ., Sapporo, Japan. Faculty of Fisheries.
For primary bibliographic entry see Field 5A.
W76-00332

EFFECTS OF INGESTED MIREX AND DDT ON JUVENILE CALLINECTES SAPIDUS RATHBUN,
Florida Univ., Gainsville. Dept. of Zoology.
C. W. Leffler.
Environmental Pollution, Vol 8, No 4, p 283-300, June 1975. 8 fig, 1 tab, 34 ref.

Descriptors: *Shellfish, *Crabs, *Chlorinated hydrocarbon pesticides, *DDT, Animal physiology, Estuaries, Ecosystems, Environmental effects, Toxicity, Food chains, Juvenile growth stage, Water pollution effects.
Identifiers: Callinectes sapidus, *Mirex, *Blue crab, Tissue analysis, Bioaccumulation.

Mirex was a more toxic stomach poison in juvenile blue crabs, Callinectes sapidus, than DDT. High, subacute internal levels of Mirex (0.02-0.2 ppm) and DDT (0.8 ppm) caused metabolic rate elevations. Mirex concentrations 0.02 ppm and above inhibited the autotomy reflex. Subacute levels of DDT and Mirex did not affect osmotic and ionic regulation. The probable impact on blue crab populations of Mirex and DDT contamination of estuarine food chains was discussed. (Klein)
W76-00333

HISTOCHEMICAL OBSERVATIONS ON THE PERMEATION OF HEAVY METALS INTO TASTE BUDS OF GOLDFISH,
Kyoto Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5A.
W76-00334

LIBRARY U. OF I. URBANA, ILLINOIS

SHIFTS IN MICROBIAL GROUPS OF RIVER WATER UPON PASSAGE THROUGH COOLING SYSTEMS,
Ghent Rijksuniversiteit (Belgium). Inter-Faculty Centre for Environmental Sanitation.
W. Verstraete, J. P. Voets, and H. Vanstaen.
Environmental Pollution, Vol 8, No 4, p 275-282, June 1975. 5 tab, 8 ref.

Descriptors: *Heated water, *Cooling water, *Ecosystems, *Bacteria, Biomass, Microorganisms, Water quality, Water pollution sources, *Growth rates, Water pollution effects, E. coli.
Identifiers: *Industrial cooling plants, Faecal streptococci.

Three industrial cooling plants were studied for their possible impact on the microbiota of the cooling water. In spite of temperature increases, ranging from 5 to 10 degrees C, no drops in cell counts were observed. Various microbial groups including Escherichia coli and faecal streptococci populations were magnified from 1 to 7 times. A shift in dominance towards mesophilic and thermophilic micro-organisms was noted and a net decrease in sporulated versus total bacteria observed. These shifts seemed to result from the fact that the industrial coolers act as tubular microbial reactors, producing at rapid rates not only aquatic microorganisms, but also faecal bacteria. (Klein)
W76-00335

THE DEVELOPMENTAL STAGES OF PSEUDODIAPTOMUS MARINUS SATO (COPEPODA, CALANOIDA) REARED IN THE LABORATORY,
Hiroshima Univ. (Japan). Dept. of Fisheries.
S. Uye, and T. Onbe.
Bulletin of the Plankton Society of Japan, Vol 21, No 2, p 65-76, April 1975. 75 fig, 2 tab, 11 ref.

Descriptors: *Plankton, *Copepods, *Phytoplankton, *Primary productivity, *Growth stages, Laboratory studies, Life history studies, Water pollution effects.
Identifiers: *Pseudodiaptomus marinus, *Nauplis growth stages, *Copepodid growth stages, Monochrysis lutheri, Nitzschia closterium.

A neritic marine copepod, Pseudodiaptomus marinus, was reared through 3 generations in the laboratory with phytoplankton, Monochrysis lutheri and Nitzschia closterium, as diet. The development stages, 6 nauplius and 5 copepodid stages, excepting the adult, were described. This species was found to have the nauplius stage I, whereas eggs of 5 species of Pseudodiaptomus hatch directly into the nauplis stage II. Duration from hatching to the adult stage was about 23 days at 20 degrees C. (Klein)
W76-00336

TOXICITY OF A LINEAR ALKYLATE SULFONATE DETERGENT TO LARVAE OF FOUR SPECIES OF FRESHWATER FISH,
National Water Quality Lab., Duluth, Minn.
J. M. McKim, J. W. Arthur, and T. W. Thorslund.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 1, p 1-7, July 1975. 1 fig, 1 tab, 11 ref.

Descriptors: *Organic compounds, *Detergents, *Sulfonates, *Pikes, *Minnows, *Linear alkylate sulfonates, *Water quality, *Suckers, *Toxicity, Water pollution sources, Growth stages, Methdology, Environmental effects, Laboratory tests, Water pollution effects.
Identifiers: Bioaccumulation, *LC-50, Northern pike, Fathead minnows, White suckers, Smallmounth bass, Esox lucius, Catostomus commersoni, Micropterus dolomieu, Pimephales promelas.

The 96-hour LC-50 values for linear alkylate sulfonate (LAS) were similar for all species (Esox lucius, Catostomus commersoni, Micropterus dolomieu, and Pimephales promelas) tested. Smallmouth bass were the most resistant to LAS detergent during the 30-day exposure, followed by Northern pike, fathead minnows, and white sucker. Water hardness was tested to determine its effects on LAS toxicity. (Klein)
W76-00337

FISH TOXICITY OF S-METHYL FENITROTHION,
Atlantic Biological Station, St. Andrews (New Brunswick).
V. Zitko, and T. D. Cunningham.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 1, p 19-24, July 1975. 1 fig, 1 tab, 9 ref.

Descriptors: *Toxicity, *Analytical techniques, *Organic compounds, *Salmon, *Atlantic salmon, *Salmonids, *Organophosphorus pesticides, Mortality, Path of pollutants, Growth stages, Juvenile growth stage, *Pollutant identification, Water pollution effects.
Identifiers: *Fenitrothion, *S-methyl fenitrothion, Bioaccumulation.

The acute toxicity of S-methyl fenitrothion to juvenile Atlantic salmon (Salmo salar) was equal to that of fenitrothion. For both compounds the nominal concentration below which no mortality occurred in 96 hours was 0.63 milligrams per liter. (Klein)
W76-00338

FLAME RETARDANT RELEASE FROM FABRICS DURING LAUNDERING AND THEIR TOXICITY TO FISH,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
W. H. Gutenmann, and D. J. Lisk.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 1, p 61-64, July 1975. 1 fig, 5 ref.

Descriptors: *Freshwater fish, *Organic compounds, *Toxicity, Textiles, Water pollution sources, Wastes, Environmental effects, Fish physiology, Water pollution effects.
Identifiers: *Flame retardants, *Goldfish, Carassius auratus, Laundering, Anticholinesterase activity, Tris phosphate, THPOH, Pyrovatex CP.

Three organophosphorus compounds (tris phosphate, Pyrovatex CP, and THPOH) which were commercially used as flame retardants for textiles were analyzed for anticholinesterase activity and toxicity to goldfish, Carassius auratus. Tris phosphate was the most toxic, followed by THPOH, then Pyrovatex CP. The environmental effects of laundering textiles with flame retardants were discussed. (Klein)
W76-00340

ON OCCURRENCE OF SIMILAR ORGANISMS TO GYMNODINIUM BREVE DAVIS IN OMURA BAY, (IN JAPANESE),
Nagasaki Univ., (Japan) Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W76-00341

UTILIZATION OF ALGAL ASSAYS TO ASSESS THE EFFECTS OF MUNICIPAL, INDUSTRIAL AND AGRICULTURAL WASTEWATER EFFLUENTS UPON PHYTOPLANKTON PRODUCTION IN THE SNAKE RIVER SYSTEM,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5A.
W76-00342

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,
Massachusetts Inst. of Tech. Cambridge, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-00355

EVALUATION OF A RECREATIONAL LAKE REHABILITATION PROJECT,
Dakota State Coll., Madison.
For primary bibliographic entry see Field 5A.
W76-00379

USE OF A BIOASSAY TEST IN EVALUATING THE TOXICITY OF DRILLING FLUID ADDITIVES ON GALVESTON BAY SHRIMP,
Milchem Inc., Houston, Tex.
For primary bibliographic entry see Field 5A.
W76-00408

BACTERICIDES USED IN DRILLING AND COMPLETION OPERATIONS,
Petrolite Corp., Tretolite Div. St. Louis, Mo.
T. J. Robichaux.
In: Conference on Environmental Aspects of Chemical Use in Well-Drilling Operations, May 21-23, 1975, Houston, Texas, 11 p, 3 tab, 4 ref.

Descriptors: Pollution, *Drilling, *Additives, *Toxicity, *Bactericides, Sulphur bacteria, Aquatic bacteria, Lethal limit, Water pollution effects, Drilling fluids, Slurries, Muds, Clays.

A list of typical drilling mud additives and their functions is given. Particularly in water base and low solids muds, the organic additives are subject to attack by microorganisms which are introduced into the mud with the water phase. Aerobic bacteria degrade or destroy the effectiveness of additives. To prevent this, bactericides are often added in preference to control by pH monitoring or control of ionic strength. Non-cationic bactericides such as aldehydes and phenols are added to drilling muds, while packer fluids and completion fluids make use of quaternary amines or acetate salts of cocoamines as the controlling bactericides. Because bactericides must be registered through Environmental Protection Agency procedures, a great deal is known about the effectiveness, treating concentration, and health and environmental hazards of the chemicals. The toxicity limits to fish and birds are listed as well as their persistency in the aquatic environment. The loss of these chemicals to the environment can be through (1) fluid loss to a permeable zone, (2) fluid loss to the target zone, (3) injection into a formation during fracing, (4) disposal of packer fluids and mud, and (5) spills. Removal may be effected by (1) dilution (2) adsorption on clay and soil, (3) deposition by flocculation, (4) biological decomposition when sufficiently diluted, (5) chemical reaction, and (6) polymerization at a high pH. (Brabbeer-NWWA)
W76-00409

ENVIRONMENTAL EFFECTS OF DRILLING MUDS AND CUTTINGS,
Shell Oil Co., Houston, Tex.
J. P. Ray, and E. A. Shinn.
In: Conference on Environmental Aspects of Chemical Use in Well-Drilling Operations, May 21-23, 1975, Houston, Texas, 16 p. 9 fig, 2 tab, 1 ref.

Descriptors: Pollution, *Marine fish, *Sea water, *Offshore platforms, Continental shelf, Turbidity, Chemistry, Mud, Chromium.
Identifiers: *Drilling rigs, *Ocean pollution, *Drilling cuttings.

Two basic topics are discussed: (1) the concentration of drilling mud discharge in the marine environment near drilling rigs, and (2) the observations of this near-rig environment by divers. Background values were obtained from literature for alkalinity, total dissolved solids, total suspended solids, total organic carbon and total chromium. These are compared with 12 samples taken around and within 60 yards of a drilling pla

orm in 245 feet of water. The samples are taken at he surface, midwater (120 ft) and bottom (245 ft). Each of the analyses varies little from the background except total dissolved solids which may be due to the analytical technique. Dilution urves are developed that indicate reduction of hromium below toxic level within 40 feet down urrent. Actual observations by divers of the rapid lispersion of drilling cuttings by ocean currents nd of the abundance of marine life on and around he platform are documented. (Bradbeer-NWWA)
W76-00411

URINARY EXCRETION OF QUINALDINE BY CHANNEL CATFISH,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
. B. Hunn, and J. L. Allen.
The Progressive Fish-Culturist, Vol 36, No 3, p 57-159, July, 1974. 1 fig, 1 tab, 12 ref.

Descriptors: *Urine, *Channel catfish, Fish natcheries, Iowa, Water pollution effects, Water pollution sources.
Identifiers: *Quinaldine sulfate, Excretion, Catherization, Fish anesthetic.

The study was undertaken to determine the rate of enal elimination of quinaldine following exposure of channel catfish obtained from the National Fish Hatchery, Fairport, Iowa. Following catheterization, the fish were placed in chambers and exposed to 30 mg/l of the anesthetic for not less than 0 minutes. Quanaldine was excreted in the urine of catfish following exposure to the anesthetic quinaldine sulfate, but the amount eliminated from he fish's body via the gill and/or gut can only be estimated. Urinary excretion of quinaldine was ess than 5 percent of the total body residue eliminated during 24 hours of withdrawal in freshwater. (Battles-East Central Oklahoma State)
W76-00439

EFFECTS OF APPLICATION RATE IN DIRECT LAND DISPOSAL OF ANIMAL WASTES,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W76-00443

ANIMAL WASTE IMPACT ON RECREATION WATERS,
Michigan Dept. of Natural Resources, Lansing. Water Quality Appraisal Section.
For primary bibliographic entry see Field 5B.
W76-00475

EFFECT OF NUTRIENT INPUT REDUCTION ON THE EUTROPHICATION OF THE MADISON LAKES.
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5G.
W76-00500

5D. Waste Treatment Processes

RATES OF WATER ENTRY INTO THE SUBSOIL OF SEVERAL SOIL SERIES IN NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
D. T. Lewis.
Research Bulletin 267, January 1975. 18 p, 3 fig, 3 tab, 15 ref, append.

Descriptors: *Soil disposal fields, *Percolation, *Sewage disposal, *Nebraska, Sewage treatment, Soils, Subsoil, Subsurface drainage, Waste water disposal, Groundwater movement, Percolating water, Soil water movement, Seepage, Infiltration, On-site investigations, Permeability, Septic tanks, Measurement.
Identifiers: *Percolation rates, Water entry rates.

Rates of water entry were measured for 11 soil series representing many of the soils in parts of Nebraska where urban growth is most intensive. Rates of water entry differed among soils even through a large amount of variation was evident within the same soil series. Differences in rate among holes at two different depths were not consistent even through it appeared that in some soils the rate beneath a clay pan was greater than in the clay pan. Rates of water entry measured at the same sites in spring when the soils were near field capacity were not different from those determined during the dry season of the preceding year, indicating that the longer wetting period used was adequate. Statistical analysis showed a highly significant negative relationship between both clay content and bulk density and rates of water entry. No significant statistical relationship between sand content and rate of water entry in the soils was evident. The soils studied either contained very little sand or the effect was masked by the compact nature of the soils that contained appreciable amounts of sand. Linear regression coefficients were found to be highly significant when clay content or bulk density were compared with rate of water entry and prediction equations were calculated. A summary of the use of rate of water entry or percolation test data to plan the size of an absorbing field for a septic tank was presented. (Sims-ISWS)
W76-00008

SIMULTANEOUS TRANSPORT OF WATER AND ADSORBED SOLUTES THROUGH SOIL UNDER TRANSIENT FLOW CONDITIONS,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-00032

ON THE COMPOSTING OF WASTES FROM THE PULP AND PAPER INDUSTRY (UEBER DIE VERKOMPOSTIERUNG VON ABFAELLEN DER ZELLSTOFF UND PAPIERINDUSTRIE),
For primary bibliographic entry see Field 5E.
W76-00038

ION FLOTATION FOR COLOR REMOVAL FROM KRAFT MILL EFFLUENT,
British Columbia Univ., Vancouver.
D. W. Herschmiller, and R. M. R. Branion.
In: Proceedings of the 28th Industrial Waste Conference, Purdue University, May 1-3, 1973. p 224-233, 16 fig, 14 ref.

Descriptors: *Pulp wastes, *Flotation, *Color, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Surfactants, Biochemical oxygen demand, Operating costs, Treatment facilities, Waste treatment, Water pollution treatment, Water quality control, Electric power demand, Costs, Economics, Ion transport, Sludge.
Identifiers: Kraft mills, Grenoble(France) recovery process, Chemical recovery.

A proposed ion flotation treatment for the purification of bleached kraft mill effluents is outlined. The process has been adapted from the Grenoble recovery process and utilizes chemicals available in the kraft cooking liquor cycle. In a limited number of tests, with nothing added to dissolve the surfactant, 5-day BOD removal varied between 18 and 30%, apparently as a result of both the natural surfactants and the ion flotation process. Although relatively costly, such a process can be readily used on dilute waste water streams; power and recovery tankage requirements are relatively small, and sludge accumulation is eliminated. (Sykes-IPC)
W76-00041

DESIGN FOR JOINT TREATMENT OF MUNICIPAL AND PAPER MILL WASTE AT LYNCHBURG, VIRGINIA,
Wiley and Wilson, Inc., Lynchburg.
W. H. Clingenpeel, and M. K. Jones.
In: Proceedings of the 28th Industrial Waste Conference, Purdue University, May 1-3, 1973. p 109-116, 2 fig, 6 ref, 1 tab.

Descriptors: *Pulp wastes, *Municipal wastes, *Treatment facilities, *Waste water treatment, Water pollution sources, Industrial wastes, Wastes, Waste treatment, Water pollution control, Water quality control, Sludge disposal, *Virginia, Mulching, Landfills.
Identifiers: Lynchburg(Virginia), Board mills, Waste paper.

Waste treatment facilities designed for joint treatment of effluent from the Mead Corporation pulp and paperboard mill and municipal wastes from the city of Lynchburg, Virginia, are described. The domestic and industrial wastes enter the plant through separate interceptors. The industrial waste receives primary settling before being combined with the domestic waste at the effluent end of the grit chambers. Sludges are disposed of as landfill, although they could possibly be used as mulch materials or soil conditioners in the future. (Sykes-IPC)
W76-00042

EFFECT OF BARK ADDITION UPON THE DEWATERING PROPERTIES OF BIOLOGICAL SLUDGES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, Mich. Central-Lake States Regional Center.
D. W. Marshall, and W. J. Gillespie.
In: Proceedings of the 28th Industrial Waste Conference, Purdue University, May 1-3, 1973. p 755-764, 7 fig, 13 ref, 2 tab.

Descriptors: *Sludge treatment, *Dewatering, *Bark, Water pollution sources, Wastes, Industrial wastes, Sludge, Hardwood, Softwood, Wood wastes, Particle size, Waste treatment, Biological treatment.

The effect of added bark particle size distribution on the dewatering properties of waste hydrous sludge-bark mixtures was investigated. Also, the conditioning properties of hardwood vs. softwood barks, as well as the magnitude of bark addition required for optimum dewatering results were examined. It was determined that the optimum conditioning of biological sludges required size range selection of bark within a range of 20 to 40 mesh. Net solids loading rates increased linearly with bark addition. However, solids retention increased as the uniformity of particle sizes constituting the bark supplement decreased. In this study, hardwood bark was found unsuitable for the conditioning of biological sludges, and it had a detrimental effect on the superior softwood when the two were combined. (Sykes-IPC)
W76-00043

COMPARATIVE STUDY OF THERMAL TECHNIQUES FOR SECONDARY SLUDGE CONDITIONING,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, Mich. Central-Lake States Regional Center.
D. W. Marshall, and W. J. Gillespie.
In: Proceedings of the 29th Industrial Waste Conference, Purdue University, May 7-9, 1974. p 589-596, 7 fig, 17 ref, 1 tab.

Descriptors: *Sludge treatment, *Heat treatment, *Pulp wastes, Temperature, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Solid wastes, Oxidation, Hydrolysis, Biochemical oxygen demand, Nitrogen, Sludge.
Identifiers: *Kraft mills, *NSSC pulp mills.

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Oxidative thermal conditioning of sludge from an integrated bleached kraft mill with supplemental neutral sulfite semichemical pulp production was evaluated at temperatures ranging from 300 to 500F. For nonoxidative conditioning the temperature range was extended to 600F. Reaction time at given temperatures was varied from zero to 40 minutes. Experimental analyses indicate that available thermal conditioning processes, whether nonoxidative or otherwise, are capable of effecting equivalent degrees of sludge conditioning which, for a given sludge, is dependent upon the volume of solids hydrolyzed. The capacity of thermal conditioning processes to hydrolyze sludge solids is primarily a function of temperature. Heat treatment liquors associated with oxidative and nonoxidative conditioning processes contain BOD concentrations of comparable magnitude, and those generated in these tests contained nitrogen concentrations up to 50% greater than that required for their biological treatment. (Sykes-IPC)
W76-00046

A STATISTICAL DOCUMENTATION OF THE PERFORMANCE OF ACTIVATED SLUDGE AND AERATED STABILIZATION BASIN SYSTEMS OPERATING IN THE PAPER INDUSTRY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, Mich. Central-Lake States Regional Center.
J. J. McKeown, D. B. Buckley, and I. Gellman.
In: Proceedings of the 29th Industrial Waste Conference, Purdue University, May 7-9, 1974 p 1091-1110. 8 fig, 5 ref, 10 tab.

Descriptors: *Pulp wastes, *Activated sludge, *Treatment facilities, *Aerated lagoons, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Performance, Pulp and paper industry, Temperature, Biological treatment, Water purification, Statistics.

The effluent quality released from 53 biological systems treating 12 categories of pulp and paper production wastes is summarized. A review of existing field data is made to develop a temperature relationship for systems which reflect climatic response. It is suggested that the performance of biological treatment systems must be examined using the appropriate time scale for characterizing effluent performance and variability. (Sykes-IPC)
W76-00047

PHYSICAL-CHEMICAL AND BIOLOGICAL TREATABILITY INVESTIGATIONS AND PROCESS DESIGN FOR A TALL OIL WASTE WATER,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
C. E. Adams, and F. G. Ziegler.
In: Proceedings of the 29th Industrial Waste Conference, Purdue University, May 7-9, 1974, p 923-944. 23 fig, 5 ref, 12 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Aerated lagoons, *Design criteria, Wastes, Industrial wastes, Water pollution sources, Biological treatment, Biochemical oxygen demand, Sludge, Settling basins, Capital costs, Operating costs, Costs, Waste treatment, Water pollution control, Chemical wastes.
Identifiers: *Tall oil, *Rosin fatty acids.

Waste water from a mill located in the southeastern United States which produces fatty acids, pitch rosin, and acid-refined and distallation-refined tall oil is characterized; and the results of treatability investigations are presented. The two-phase investigation consisted of an examination of physical-chemical methods required to remove oily and emulsified materials from solution, followed by biological studies on the actual effluent from the physical-chemical plant so that the influent to the biological system would be representative of full-scale performance. The physical-chemical treatment consisted of pH adjustment and chemical addition to break the emulsion and form a coagulated sludge which was removed by gravity sedimentation. The biological treatment system was designed for a maximum BOD discharge of 40 lb/day (Approximately 0.24 lb/ton of tall oil). The aerated lagoon is followed by a 3-day settling basin designed to accumulate sludge produced within the aerated lagoon for a period of 5 years. Cost estimates (Capital and operating) are included. (Sykes-IPC)
W76-00049

THE RECYCLING OF KRAFT BLEACH WASTES,
Montana State Univ., Dept. of Civil Engineering.
R. L. Sanks.
Journal Water Pollution Control Federation, Vol 47, No 7, p 1924-1932, July, 1975. 1 fig, 12 ref, 8 tab.

Descriptors: *Bleaching wastes, *Recycling, *Ion exchange, *Waste water treatment, Color, Resins, Activated carbon, Water reuse, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Pulp wastes, Costs, Labor, Chemicals, Maintenance, Effluents, Carbon, Separation techniques, Water purification, Water quality control, Water pollution treatment, Water conservation, Industrial water.
Identifiers: *Kraft mills.

Twenty resins and seven activated carbons were evaluated for the removal of color and minerals from a kraft bleach plant effluent. The best resins were generally equal to the best carbons for decolorization. Single-stage ion-exchange with starvation regeneration produced reusable water that was adequate for unbleached pulping. Two-stage ion-exchange produced reusable water adequate for bleached pulping. The cost including amortization over 10 years at 9% interest, labor, chemicals, and maintenance varied from $0.42/1000 gal ($0.11/cu m) to $1.38/1000 gal ($0.36/cu m) of product depending on the assumptions. Ion-exchange thus seems to be competitive with other processes. (Witt-IPC)
W76-00051

WASTE TREATMENT VARIABLES FOR KRAFT MILLS,
Paper Industry Engineers, Inc., Atlanta, Ga.
V. B. Bodenheimer.
Southern Pulp and Paper Manufacturer, Vol 38, No 7, p 29-32, July, 1975. 2 fig, 2 ref, 4 tab.

Descriptors: *Pulp wastes, *Aerated lagoons, *Activated sludge, *Waste water treatment, Biochemical oxygen demand, Temperature, Retention, Time, Depth, Lagoons, Oxidation lagoons, Wastes, Waste treatment, Industrial wastes, Water pollution sources, Suspended solids, Sulfite liquors, Water pollution treatment, Water quality control, Operations, Design, Control, Treatment facilities, Biological treatment, Aeration.
Identifiers: *Kraft mills, *NSSC pulp mills.

Important parameters affecting the operation of naturally and artificially aerated lagoons and conventional and oxygen-aided activated sludge systems treating kraft mill and kraft/neutral sulfite semichemical mill wastes are defined. Formulas are given showing the effects of initial BOD, temperature, time (retention time in days), and depth on the final BOD of effluent treated in naturally and artifically aerated lagoons. In the activated sludge treatment systems, final BOD of the treated effluent depends on the initial BOD, mixed liquor suspended solids (suspended solids concentration after mixing of influent waste and recycled sludge), temperature, and a time factor (roughly equivalent to the total aeration time in days). The formulas are of value for waste treatment system design and control purposes. Suspended solids removal is an area that needs more study. The consensus is that the standard for suspended solids for bleached kraft pulp is 5.5 lb/ton. Treatment systems meeting this standard are natural lagoons or low-rate aerated systems having at least 26 days total retention time. The advantages and disadvantages of naturally and artificially aerated lagoons and conventional activated sludge treatment are listed. (Witt-IPC)
W76-00052

CHANGES IN RECIRCULATED WATER IN PAPER MACHINE OVER A SIX DAY PERI (VERAENDERUNGEN IM KREISLAUFWASS EINER PAPIERMASCHINE WAEHRE EINER 6 TAGE-BETRIEBSPERIODE),
Institut Papiertechnische Stiftung, Mun (Germany).
J. Weigl, and M. Baumeister.
English translation of Wochenblatt fur Pap fabrikation, Vol 103, No 11/12, p 425-428, June 1975. 9 fig, 9 ref, 1 tab.

Descriptors: *Recirculated water, *Water re *Industrial water, *Pulp and paper indus Recycling, Water, Sulfates, Ions, Bacteria, E trolytes, Flocculation, Water pollution cont Water quality, Foreign countries, Alumin Water conservation, Europe.
Identifiers: *Paper machine, Aluminum sulf Polyethylenimine, Retention aids, Germany.

The changes in the water of a partly closed circ tion system on a paper machine at Munch Dachauer Papierfabriken Heinrich Nico GmbH (Germany) were studied. There was an crease in sulfate ion concentration during op tion, but there was no aluminum ion in the fluent. This indicates that the aluminum sul added to polyethylenimine as a retention aid fo a complex which is practically quantitati retained. The bacterial count decreased steac probably due to flocculation by the increa electrolyte concentration. (Ward-IPC)
W76-00053

CONSIDERATIONS REGARDING OPERATI OF PAPER MILLS WITHOUT EFFLUE (GEDANKEN ZUM ABWASSERLOS BETRIEV VON PAPIERFABRIKEN),
Soehne (Julius Schulte) K. G., Duesseldorf- (Germany).
D. Pothmann.
Wochenblatt fur Papierfabrikation, Vol 103, 11/12, p 382-383, June 30, 1975. 2 fig, 3 ref.

Descriptors: *Pulp and paper industry, *W reuse, Salts, Anaerobic conditions, Sulfa Hydrogen sulfide, Corrosion, Recycling, W pollution control, Industrial water, Water con vation, Effluents, Recirculated water, *W water treatment.
Identifiers: Paper machines.

Simple calculations show that complete closur the water cycle in the paper mill will lead to salt cumulation in the water. Moreover, anaero breakdown of sulfates can lead to formation corrosive hydrogen sulfide. These problems be avoided by not closing the cycle completely. stead of freshwater, biologically purified outs effluents may be added to such a system. (W IPC)
W76-00056

SLUDGE DEWATERING IN EFFLUENT RIFICATION PLANTS OF THE PULP A PAPER INDUSTRY WITH SPEC REFERENCE TO THE TWIN-BELT PR (SCHLAMMENTWAESSERUNG IN ABW SERREINIGUNGS- ANLAGEN DER ZE STOFF-UND PAPIERINDUSTRIE UNT BESONDERER BERUECKSICHTIGUNG D DOPPELSIEBPRESSE),
Maschinenfabrik Andritz, A. G. Graz, (Austria F. Wultsch, and J. Bauer.

Wochenblatt fur Papierfabrikation, Vol 103, No 11/12, p 429-432, 434-436, June 30, 1975. 16 fig, 6 ref, 1 tab.

Descriptors: *Sludge treatment, *Dewatering, *Equipment, *Filters, Energy, Costs, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Waste water treatment, Treatment facilities, Operation and maintenance.
Identifiers: Vacuum filters, Filter presses, Centrifuge, Twin-belt press, Presses.

An analysis of the principles of sludge dewatering is followed by a comparison of the mechanism, energy consumption, and costs of four types of operation--vacuum filter, filter press, centrifuge, and twin-belt press. The last named equipment is then described and discussed in some detail. (Ward-IPC)
W76-00057

CHEMISTRY OF WATER SUPPLY, TREATMENT, AND DISTRIBUTION,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 5F.
W76-00102

REMOVAL OF CADMIUM FROM WATERS AND WASTES BY SORPTION ON HYDROUS METAL OXIDES FOR WATER TREATMENT,
Monroe County Community Coll., Mich.
H. S. Posselt, and W. J. Weber, Jr.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 89-108. 6 fig, 14 ref.

Descriptors: *Waste water treatment, *Cadmium, *Sorption, *Water treatment, Aluminum, Iron oxides, Manganese, Metals, Water quality control, Water pollution sources, Water pollution control, Water purification, Pollutants.

The sorption behavior of hydrous oxides of Al(III), Fe(III), and Mn(IV) toward trace amounts of cadmium was examined over a wide range of conditions. The uptake of cadmium on the sorbents can be described by the Langmuir sorption equation. Sorption rates on highly dispersed oxides are extremely rapid, with equilibrium occurring in less than 10 minutes. Both the limiting sorption capacity and adsorption affinity for cadmium increased beyond the pH of zero point of charge (ZPC). Hydrous manganese dioxide, prepared by reduction of permanganate, was superior to the Al and Fe hydrous oxides. The practical range for Al(III) salts is limited due to the formation of aluminate ion and a relatively high ZPC for insoluble Al hydrolysis products. The sorption of cadmium exhibits a small dependence on ionic strength. Competitive effects from uptake of calcium or from chloride complexation are also weak. These findings suggest that sorption on hydrous oxides of Mn(IV) and Fe(III) is a feasible approach for removing cadmium from water and waste waters. (See also W76-00102) (Witt-IPC)
W76-00107

CHEMISTRY OF SULFUR SPECIES AND THEIR REMOVAL FROM WATER SUPPLY,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5F.
W76-00108

CHEMICAL FORMS OF ARSENIC IN WATER SUPPLIES AND THEIR REMOVAL,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5F.
W76-00109

EFFECT OF ALUMINUM(III) HYDROLYSIS ON ALUM COAGULATION,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 5F.
W76-00110

MODEL SAND FILTERS FOR THE REMOVAL OF COLLOIDAL MANGANESE OXIDES USING SELECTED CATIONS AS FILTER AIDS,
Wyoming Univ., Laramie. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-00111

INFLUENCE OF SURFACE OXIDES ON ADSORPTION AND CATALYSIS WITH ACTIVATED CARBON,
Maryland Univ., College Park. Dept. of Civil Engineering.
C. Ishizaki, and J. T. Cookson, Jr.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 201-231. 10 fig, 34 ref, 13 tab.

Descriptors: *Organic compounds, *Waste water treatment, *Activated carbon, *Adsorption, Oxides, Separation techniques, Oxygen, Water pollution sources, Carbon, Water treatment, Water quality control, Oxidation, Catalysis.
Identifiers: Methylation, Ammonium persulfate, Outgassing, Butyl mercaptan, Butyl disulfide, Decane, p-Hydroxybenzaldehyde, Filtrasorb 200 carbon.

The surface of Filtrasorb 200 activated carbon was modified by chemical and physical treatments, including methylation, oxidation with aqueous solution of ammonium persulfate, vacuum outgassing, and dry oxidation with oxygen, and the adsorption capabilities of the carbons for butyl mercaptan, butyl disulfide, decane, and p-hydroxybenzaldehyde were determined and compared to those of untreated Filtrasorb for the same organic compounds. The adsorption capacities of the untreated and modified carbons were nearly the same. The minor differences (10%) noted were due to preferential adsorption of water by the carbon. Acidic surface oxides on the carbon reduced the affinity of aromatic adsorbates but not the rate of adsorption. (See also W76-00102) (Witt-IPC)
W76-00112

ACTIVE CARBON: DECHLORINATION AND THE ADSORPTION OF ORGANIC COMPOUNDS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. L. Snoeyink, H. T. Lai, J. H. Johnson, and J. F. Young.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 233-252. 5 fig, 22 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Chlorination, *Organic compounds, *Adsorption, Separation techniques, Phenols, Carbon, Oxides, Chlorine, Water treatment, Water purification, Water quality control, Water pollution sources, Disinfection.
Identifiers: p-Nitrophenol, Filtrasorb 400 carbon, Sodium hypochlorite.

Following reaction of Filtrasorb 400 activated carbon with NaOCl and determination of residual chlorine, the carbon was analyzed for its content of surface oxides and its adsorption capacity of p-nitrophenol and phenol after no further treatment, washing, drying, or drying plus outgassing. A definite relationship was found between the buildup of acidic surface oxides and the degree of treatment with free chlorine. The surface has a maximum level of oxides that it can accomodate, but many of the oxides or oxygen-containing reaction products are volatile. The adsorption capacity of carbon for p-nitrophenol and phenol was decreased by repeated cycles of treatment with free chlorine and drying after each cycle. The presence of fixed oxides reduced the adsorption capacity. (See also W76-00102) (Witt-IPC)
W76-00113

INTERACTIONS OF AQUEOUS CHLORINE WITH ACTIVATED CARBON,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-00114

EFFECTIVENESS OF HYPOCHLOROUS ACID AND HYPOCHLORITE ION IN DESTRUCTION OF VIRUSES AND BACTERIA,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5F.
W76-00117

KINETICS OF VIRAL INACTIVATION BY BROMINE,
National Inst., for Occupation Safety and Health, Cincinnati, Ohio.
For primary bibliographic entry see Field 5F.
W76-00118

INACTIVATION OF VIRUSES AND BACTERIA BY OZONE,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5F.
W76-00119

INVESTIGATIONS ON THE CONDITIONS FOR WET AIR OXIDATION OF COLLAGEN AND TALLOW AS MAIN COMPONENTS OF TANNERY WASTE, (IN JAPANESE),
Yamazaki Chemical Lab., Yoshii (Japan).
K. Shirai, and H. Okamura.
Hikaku Kagaku, (Leather Chemical), Vol 21, No 1, p 10-17, June, 1975. 7 fig, 3 tab, 6 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Tannery wastes, Foreign research, Chemical oxygen demand, Suspended solids, Coagulation, Activated sludge.
Identifiers: *Wet-air oxidation, Collagen, Tallow.

The high concentrations of chemical oxygen demand (COD) and suspended solids (SS) in tannery wastes make it impossible to achieve an acceptable level of pollution by conventional techniques utilizing coagulating agents and activated sludge. The wet air oxidation process, which has proven successful for purifying domestic wastes, is generally considered to decompose all organic solid wastes to a clear solution by means of high temperature and high pressure oxygen. This process is expected to be suitable for the treatment of tannery wastes. The reaction conditions for wet air oxidation of collagen and tallow, the main components of tannery wastes, were investigated. An aqueous suspension of collagen and tallow, containing 20 g/liter COD, was reacted with air at a pressure of 50-110 kg/sq cm and a temperature of 105-300 C. The COD content of the substrate decreased to 10-20 percent at its lowest level (Based on the charged COD) after being subjected for sixty minutes to a reaction temperature higher than 180 C. When acidic reaction medium was used in place of pure water and a larger quantity of substrate was charged, a higher rate of COD removal was attained. Although complete degradation of collagen and tallow can not be achieved by wet air oxidation alone, this process is a suitable method for the preliminary treatment of tannery waste prior to conventional coagulation. (Orr-FIRL)
W76-00121

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EFFECT OF THE INORGANIC COAGULANT FOR THE DYEING WASTE WATER TREATMENT WITH OZONE, (IN JAPANESE),
K. Yasutome, T. Takiguchi, S. Shimizu, S. Nakano, and A. Sato.
Kogai, (Pollution Control) Vol 10, No 4, p 20-27, July, 1975. 6 fig, 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Dyes, *Textiles, *Ozone, Emulsions, Oily water, Turbidity, Color, Sludge.
Identifiers: Oil/water emulsions.

Oil/water emulsions are frequently used in the oiling process of fiber dyeing. These emulsions produce high values of COD, BOD, and n-hexane extractables in the waste water which in turn increase the turbidity. Various types of dyeing waste water were subjected to treatment by ozone with an inorganic coagulant, and the removal of the emulsion was determined. The process was capable of removing around 100 percent of the oil emulsion and colored organic compounds. The volume of sludge formed was one-third to one-half of the normal volume. (Orr-FIRL)
W76-00122

POLLUTION FROM TANNING INDUSTRY,
Regional Engineering Coll., Tiruchirapalli (India).
S. Shanmugasundaram, and V. Pachaiyappan.
Chemical Age of India, Vol 26, No 5, p 368-374, May, 1975. 3 fig, 5 tab, 19 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Tannery wastes, Biological treatment, Sedimentation, Lagoons, Chemical precipitation, Trickling filters, Activated sludge, Ion exchange, Chlorination.
Identifiers: Chemical treatment, Physical treatment, *India.

The annual production of skins in India is estimated to be 15.86 million pieces. Leather manufacturing includes pre-tanning, tanning and post-tanning operations. The general methods used for the treatment of tannery wastes fall into four classifications: separation and removal; alteration; combination; and, elimination. The methods can be further divided into either physical, chemical, or biological treatment methods. Physical treatment methods include simple sedimentation, sedimentation with controlled pH, and lagooning. Chemical treatment methods include treatment with ferric chloride or alum, flue gas and lime treatment, ion exchange processes, chlorination, and adsorption on activated charcoal. Biological methods are trickling filtration and activated sludge treatment as well as various low cost methods. The low cost methods are non-mechanized methods, such as oxidation ponds and anaerobic lagoons, and mechanical methods, such as oxidation ditches and aerated lagoons. Five process combinations employing low cost methods were studied. Simple settling of the tannery effluent in settling tanks for 8 hours produced a percent reduction in BOD, COD, and suspended solids of about 43, 42, and 82, respectively. Tannery effluents in India should be treated by simple settling for 8 hours followed by lagooning or biological or chemical treatment depending on the land availability and cost of treatment. (Orr-FIRL)
W76-00123

REMOVAL OF OILS FROM WASTE WATERS (OCHISTKA STOCHNYKH VOD OT MASEL),
V. M. Kagasovk, E. K. Derysheva, I. V. Pimenov, N. D. Khlebnidov, and N. D. Pavlyuk.
Koks i Khimiya, No 6, p 36-38, 1975. 3 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Oil wastes, Phenols, Coagulation, Pretreatment, Flotation, Sedimentation.
Identifiers: Cokery effluents, Ferrous sulfate, Orthophosphoric acid.

An improved method for the removal of oils from phenolic waste waters generated in cokeries is described. It involves settling and subsequent flotation. The waste water is pre-treated with ferrous sulfate to facilitate the coagulation of colloidal oil particles. Ferrous sulfate is added at a concentration of 30-70 mg/liter. Orthophosphoric acid is added to prevent the oxidation of bivalent iron into the trivalent form. Up to a 50 percent reduction can be achieved in the residual oil content. (Takacs-FIRL)
W76-00124

TREATMENT OF DYEING WASTE WATER WITH ACTIVATED CARBON (KASSEITAN KYUCHAKU HO NI YORU SENSHOKU HAISUI SHORI),
H. Tatsumoto.
Yosui to Haisui, (Jour. of Water and Waste), Vol 17, No 8, p 997-1001, August, 1975. 6 fig, 5 tab, 20 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Dyes, *Textiles, *Activated carbon, Surfactants, Biochemical oxygen demand, Chemical oxygen demand, Chemical precipitation.
Identifiers: Basic dyes, Disperse dyes, Sulfide dyes, Acidic dyes.

Activated carbon adsorption for the treatment of dyeing waste water is reviewed. The adsorptivity of dyes depends on the type of activated carbon employed, chemical structure of the dyes, solution pH, solution temperature, contacting method of solution with activated carbon, and composition of the waste water. Basic dyes such as Malachite Green and Rhodamin B are adsorbed well by most activated carbons, while the adsorption of sulfide dyes such as Sulfur Black BRX is poor. The adsorption of acidic and basic dyes by fabric is 60 to 80 percent, but that of sulfide dyes is less, therefore sulfide dyes tend to appear in higher concentrations in the waste water. The removal of disperse dyes from waste water by either carbon adsorption or coagulation precipitation is not effective; each method provides only 70 to 80 percent removal efficiency. If the two methods are used successively, 90 to 95 percent of disperse dyes can be removed from water. Surfactants contained in all dyes produce high BOD and COD values in the waste water. Activated carbon is the most effective method for the removal of surfactants from the waste water. (Katayama-FIRL)
W76-00125

DETERMINATION OF THE POSSIBILITY OF THE BIOLOGICAL TREATMENT OF WASTE-WATERS GENERATED IN PETROLEUM REFINERIES. PART V. DEGRADATION OF NAPHTHENIC ACIDS AND SULFONIC ACIDS (DETERMINAREA TRATABILITATII BIOLOGICE A APELOR REZIDUALE DIN RAFINARIILE DE PETROL. V. DEGRADAREA ACIZILOR NAFTENICI SI A ACIZILOR SULFONICI).
V. I. Pop, and S. I. Ionescu-Homoriceanu.
Revista de Chimie, Vol 26, No 3, p 241-243, March, 1975. 3 fig, 21 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Activated sludge, Biodegradation, Microorganisms, *Biological treatment.
Identifiers: Naphthenic acids, Sulfonic acids, Petroleum refineries.

Experimental studies were conducted on the biodegradation of residual waters from oil refineries by activated sludge in the presence of naphthenic and sulfonic acids. Naphthenic and sulfonic acids are constant constituents of waste water generated in petroleum refineries. The experimental installation was a continuous two-level process utilizing completely mixed activated sludge. The activated sludge was obtained from domestic sewage sludge. By using a biological sludge adapted to naphthenic acids, it was possible to achieve 97 percent biodegradation after 6 hours of treatment. The sulfonic acids had no toxic effects on the biological system, but reduced the oxygen transfer and were only partially degraded thus increasing the oxygen demand of the treated effluent. Addition of a second respiration substrate, lactose, increased the biodegradation. Since there are specific bacteria which are capable of degrading naphthenic acids, these specific specialized microbial populations should be used. Naphthenic acids are used as the growth substrate by these microorganisms. There is no universal activated sludge that can be used for the treatment of refinery wastes containing naphthenic acids. (FIRL)
W76-00126

OIL POLLUTION OF THE SEA AND THE PETROLEUM INDUSTRY (VERTIDOS AL MAR EN LA INDUSTRIA DEL PETROLEO),
For primary bibliographic entry see Field 5G.
W76-00127

BIOLOGICAL TREATMENT OF WASTE WATERS IN A CARDBOARD MANUFACTURING PLANT (TRATTAMENTO BIOLOGICO DELLE ACQUE DI SCARICO DI UN CARTONIFICIO),
V. Scarlata, and E. Porrozzi.
Cellulose e Carta, Vol 26, No 4, p 29-38, April 1975. 4 fig, 2 tab, 18 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pilot plants, *Activated sludge, *Oxidation, *Biological treatment, Dyes, Nutrients, Biochemical oxygen demand, Chemical oxygen demand, Costs, *Pulp water, *Treatment facilities.
Identifiers: Total oxidation, Physico-chemical treatment, Inks.

A comparative study was made of two waste water treatment pilot plants, one utilizing activated sludge, the other a total oxidation plant, in purifying the effluents from a corrugated cardboard box factory. The principal pollution problems come from the gluing and printing stages of production. The dyes and inks used in the latter stage were found to have a toxic effect on the microflora of the biotreatment plant and were therefore kept separate for testing purposes. In addition, phosphorus, nitrogen and alum had to be added as nutrients. The activated sludge plant, operated under these conditions, eliminated 92.6 percent of the BOD and 88.4 percent of the COD from the inflow in 2.5 hours, while the total oxidation system eliminated 96.2 percent BOD in 24 hours. Although it seemed preferable in many ways to use total oxidation because of greater structural simplicity and lower operating costs, the choice eventually was the bio-treatment plant (Which is now being used because it occupies about one fifth the space. A physico-chemical purification plant is used in conjunction with the activated sludge in order to treat the dyes used in printing. (Morrow-FIRL)
W76-00128

SLUDGE DEHYDRATION IN WASTEWATER TREATMENT PLANTS OF THE PULP AND PAPER INDUSTRY WITH SPECIAL REGARD TO THE DOUBLE FILTER PRESS (SCHLAMMENTWAESSERUNG IN ABWASSERREINIGUNGSANLAGEN DER ZELLSTOFF UND PAPIERINDUSTRIE UNTER BESONDERER BERUECKSICHTIGUNG DER DOPPELSIEBPRESSE),
R. Wultsch, and J. Bauer.
Wochenblatt fuer Papierfabrikation, Vol 103, No 11/12, p 429-432, 434-436, June, 1975. 16 fig, 1 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Filters, *Filtration, Equipment, Sludge treatment, *Dewatering, *Pulp wastes.

dentifiers: *Double filter press.

double filter press designed for the dewatering f sludges generated in pulp and paper mills is escribed, and compared with other conventional ehydrating equipment. Gradual dewatering after preliminary gravitational dewatering stage is chieved by the wedge-shaped arrangement of the vo filter bands pressed by press rollers in variable onfiguration. The filter cake obtained has a dry atter content of 45 percent. (Takacs-FIRL)
/76-00129

NY CAR REPAIR SHOP CAN HAVE ITS OWN QUIPMENT FOR THE TREATMENT OF USED IL EMULSIONS (OGNI OFFICINA MEC-ANICA PUO AVERE IL SUO IMPIANTO PER TRATTAMENTO DELLE EMULSIONI LEOSE ESAUSTE).
nquinamento, Vol 17, No 6, p 48-50, June, 1975. 5 g.

escriptors: *Waste water treatment, *Industrial astes, Emulsions, Equipment, *Oil wastes, Oil ollution, Water pollution control, Pollution abate-ent.
dentifiers: Acidification, Automotive shops, etalworking operations.

he Ecology Department of FIAT has begun roducing treatment plants for the recovery of oils om used oil emulsions deriving from the various etalworking operations of an automotive shop. reatment consists of breaking up the emulsion by hot acidification process. The smallest of four odels, the IREO DO5, has a capacity of 500 liters er day, is loaded and unloaded by hand, and equires electric power, compressed air supply, nd a water drain. Costwise and spacewise it is uited to almost all shops. Also hand loaded is the REO D2, with a daily capacity of 2000 liters. The ass production models, IREO 500 and IREO 000, with capacities of 500 and 2000 liters respec-vely, require specially trained personnel for their peration and are better suited to larger opera-ons. (Morrow-FIRL)
/76-00130

N THE WET AIR OXIDATION PRODUCTS OF OLLAGEN AND TALLOW, (IN JAPANESE),
amazaki Chemical Lab., Yoshii (Japan).
. Shirai, and H. Okamura.
itaku Kagaku, Vol 21, No 1, p 18-24, June, 1975. fig, 5 tab, 4 ref. (English summary).

escriptors: *Waste water treatment, *Industrial astes, *Tannery wastes, Foreign research, itrogen compounds, Chemical oxygen demand, mino acids.
dentifiers: *Wet air oxidation, Collagen, Tallow.

he wet air oxidation of tannery wastes was in-estigated. The reaction conditions for the wet air xidation of collagen and tallow, the main com-onents of tannery wastes, were examined. The nalytical data of the oxidation products of col-gen and tallow are discussed. The nitrogen con-nt of oxidized collagen and the fat content of ox-ized tallow were both considerably decreased by e use of a high oxidation temperature and acidic edium. This decrease agrees with the chemical xygen demand (COD) change during the period oxidation but seems to be more definitive than at of COD. Removal rates for nitrogen com-ounds increased in the following order: COD less an total nitrogen less than amino nitrogen less an hydroxproline nitrogen. This order indicates e complexity of the composition of intermediate roducts in wet air oxidation. The quantity of com-ned amino nitrogen and hydroxproline nitrogen ecreased by wet air oxidation but did not cause increase in the quantity of free amino nitrogen nd hydroxyproline nitrogen. Only a limited mount of low molecular weight substances, such amino acids, are produced during the wet air ox-ation of collagen and these are immediately con-erted into simpler compounds. (Orr-FIRL)
W76-00131

ON THE WASTE WATER TREATMENT SYSTEM BY PRESENT LANCY METHOD (GENJO NI OKERU RANSHI HOSHIKI NI YORU HAISUISHORI SHISUTEMU NI TSUITE),
K. Ishiyama.
Boshoku Kanri, (Rust Prevention and Control), Vol 19, No 7, p 12-18, July, 1975. 8 fig, 6 tab, 2 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Chemical reactions, Water conservation, Water reuse, Sludge.
Identifiers: *Metal finishing industry wastes, *Lancy method.

The Lancy method for the purification of waste water from metal surface treatment industries was discussed. The Lancy method utilized chemical rinsing processes which were incorporated into the metal surface treatment processes. The processed metal surfaces were cleaned at the end of each process by a chemical reagent rather than with water; therefore, the chemical cleaning process could be made effective by choosing the appropriate chemical reagent for each manufacturing process and unnecessary water rinsing was considerably reduced. The sludge formed from chemical rinsings was generally heavy and consisted of large flocs. Sludge precipitation was rapid and a high sludge concentration (5 percent) could be obtained. The amount of sludge produced was 10 percent of the amount produced by conventional coagulation precipitation treatment. Since chemical rinsing steps were employed at each manufacturing process, the sludge produced contained only the simple metal composition characteristic to the process, which made sludge disposal easier. As much as 97 percent of the rinse water required in most of metal surface treatment industries could be saved if the Lancy method is used. The water used in the final rinsing step would have a less complicated chemical composition, facilitating purification for water reuse. (Katayama-FIRL)
W76-00132

WASTE WATER DISPOSAL OF PAINTING FACTORY AND CLOSED-SYSTEMATIZATION (TOSO KOJO NO HAISUI SHORI TO KUROZU-DO-SHISUTEMU KA),
Y. Kinugasa, and T. Kawanishi.
Kankyo Sozo, (Environmental Creation), Vol 5, No 6, p 67-71, June, 1975. 4 fig, 8 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Water circulation *Water reuse, Closed conduits, Cooling water, Sewage, Suspended solids, Filtration, Ion exchange, Zinc, Activated carbon, Reverse osmosis, Tertiary treatment, Water quality, Chemical oxygen demand, Biochemical oxygen demand, Alkyl benzene sulfonates, *Recycling.
Identifiers: *Paint factory wastes, Zero discharge, Closed water cycles.

A closed-cycle for the waste water from paint factories was described. Waste water was classified into three groups: waste cooling water from machines; waste water from the painting processes; and, domestic waste water from factory workers. The waste cooling water was cooled and filtered to remove suspended solids (SS), and then recirculated. The waste rinse water was filtered to remove SS and n-hexane extractable components, further treated with activated carbon to adsorb COD components, and finally by ion exchange to remove the remaining zinc. The waste water produced by factory processes other than rinsing had a variable pH and contained larger quantities of waste materials, necessitating more extensive treatment. The pH of this waste water was adjusted by slaked lime, and coagulation precipitation using ferric chloride was performed before filtration. The filtered water was then treated with activated carbon and reverse osmosis was employed for final treatment. This advanced treatment produced reusable water and contained one ppm BOC, 5 ppm COD, 2 ppm SS, 0.05 ppm Zn, and 0.05 ppm ABS. The system can recirculate 95 to 98 percent of the waste water generated by paint factories. (Katayama-FIRL)
W76-00133

PRESENT SITUATION OF WASTE WATER FROM PRINTING AND FILM DEVELOPING PLANTS AND TREATMENT (INSATSU SHASHIN GENZO KOJO HAISUI NO JITTAI CHOSA TO SHORI NI TSUITE),
S. Sasaki.
Kankocho Kogai Senmon Shiryo, (Government Offices Pollution Data), Vol 10, No 4, p 63-74, July, 1975. 11 fig, 9 tab, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Water quality, Standards, Heat treatment, Ion exchange, Ozone, *Oxidation.
Identifiers: *Photographic processing wastes, Electrolytic oxidation.

The quality of waste water from 7 printing and 9 film developing factories was determined with respect to pH, BOD, COD, manganese, zinc, lead, chromium, cadmium, and cyanide. All concentrations present in the discharged waste water from the film developing factories were within water quality standards, however, the waste developing solution and waste fixing solution had a high COD content which was treated before final discharge. High cyanide ion concentrations were generally produced by the bleaching process of film developing; the waste bleaching solution also had a high iron content. These ions were present in the form of potassium ferricyanide or ferricyanide. A heat decomposition method with sodium hydroxide and sodium hypochlorite or a precipitation separation method with ferrous sulfate was used to treat the waste bleaching solution, achieving less than 0.5 ppm cyanide in the treated water. Ion exchange can also be used to treat waste bleaching solution. Cadmium and manganese were removed by precipitating as hydroxides at a pH of 11 to 12. Cadmium can be further removed by the addition of hydrogen sulfide. The electrolytic oxidation method for COD treatment was unsatisfactory, giving only 11 percent COD removal. The ozone oxidation method achieved 74 percent COD removal if the COD content in the waste water was low; the removal efficiency decreased with increasing COD content. One hundred percent efficiency for BOD and COD removal can be expected from the combustion method; however, this method causes secondary pollution by forming sulfur oxides. (Katayama-FIRL)
W76-00134

REDUCTION OF AQUEOUS FREE CHLORINE WITH GRANULAR ACTIVATED CARBON,
Illinois Univ., Urbana. Dept. of Civil Engineering.
M. T. Suidan, and V. L. Snoeyink.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 767, $5.25 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 103, August 1975, 108 p, 20 fig, 27 ref, 2 append. OWRT A-066-ILL(1), 14-31-0001-5013.

Descriptors: *Waste water treatment, *Activated carbon, *Mathematical models, Diffusion, Chemical reactions, Particle size, Hydrogen ion concentration, Chlorine, Model studies.
Identifiers: *Dechlorination, Pore diffusion, Packed bed models, *Batch reactors, Temperature effects, *Diffusion models.

A surface reaction rate expression was developed to describe the heterogeneous reaction between aqueous free chlorine and granular activated carbon. This expression was then incorporated into a pore diffusion model and the relevant partial differential equations with the corresponding boundary conditions were solved for the case of (1) a

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constant concentration batch reactor and (2) a closed batch reactor. The solutions were then compared to similar batch data in order to evaluate the pore model constants. A packed bed reactor model was then solved using the rate information from the batch mathematical models and experimental data. The predicted results from the packed bed model were then compared to experimental results. The effect of particle size on the rate of removal of free chlorine was investigated both in batch and packed bed column form. The effect of pH on the rate of reaction was studied in the pH range of 4-10. The pH affects the rate insofar as it affects the distribution of free chlorine between OCl and HOCl. Temperature effects were also studied in the range 2-35C. The effect of temperature on the surface dissociation rate constant corresponds to the Arrhenius law.
W76-00176

BENEFICIAL RECYCLING OF WASTE,
Bauer, Sheaffer, and Lear, Inc., Chicago, Ill.
J. R. Sheaffer.
The High Plains: Problems of Semiarid Environments, Colorado State Univ., Fort Collins, p 89-96, (1972) 1 fig, 14 ref.

Descriptors: *Water management(Applied), *Waste water treatment, *Recycling, *Reclaimed water, Semiarid climates, Water utilization, Water resources, Water reuse, Waste water disposal, Sewage effluents, Sewage treatment, Water quality.
Identifiers: *High plains region.

Several changes in broad national programs that have the potential to influence the management of wastes in the United States are briefly discussed with an effort made to relate these changes to the High Plains. A working example of the wastewater management system is Muskegon County, Michigan is described which achieves a high degree of treatment so that reclaimed water meets Public Health Service drinking water quality standards. Emphasis is on the land treatment of sewage effluent and economic feasibility of wastewater recycling. (See also W76-00179) (Robinett-Arozona)
W76-00182

BREAKTHROUGH IN SEWAGE TREATMENT-A USER'S VIEW,
J. Eno.
Water, No 4, p 18-19, July, 1975. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, *Costs, Economic efficiency, Energy conservation, Sludge.
Identifiers: *Deep Shaft Process.

A pilot plant study of the deep shaft aeration process (Developed by ICI) for effluent treatment is being conducted at the Billingham (Cleveland) sewage disposal works of the Northumbrian Water Authority. Operation started in July 1974; the pilot plant works in parallel with the main sewage treatment plant. Preliminary results suggest the need for further development to study plant parameters under variable operating conditions and on a larger scale before the system is generally accepted as a desirable alternative to conventional treatment methods. Of the claims by the manufacturer for this process, lowered sludge production and power consumption are the most important. With an appropriate balance of retention period, effluent substrate concentration, and degree of endogenous respiration, the treatment unit should produce a low quantity of well mineralized sludge. The cost of this goal needs to be evaluated in terms of process costs before any economical advantage can be determined. The claims of energy conservation, and therefore costs, must be compared with the economics of percolating filter plants. The relationship of construction costs to the biological kinetics of the process must be investigated. The interrelation of shaft diameter and construction costs becomes significant when the proposed plant size is between the practical limits of drilling and mining technology. (Orr-FIRL)
W76-00202

TREATMENT OF MUNICIPAL WASTEWATER BY LAND APPLICATION,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5E.
W76-00203

NEW CHLORINE APPLICATION IMPROVES VIRAL KILLS.
Water and Sewage Works, Reference Number, R68-R70, R72, R74, April 30, 1975. 7 fig.

Descriptors: *Waste water treatment, *Disinfection, *Chlorination, *Pathogenic bacteria, *Viruses, Bacteria, Sewage treatment, Equipment, Jets, Mixing, Public health.

Disinfection of waste water by the direct application of raw chlorine gas has been accomplished by the use of a gas nozzle unit. The disinfection unit incorporates a double set of nozzles, one for motive flow and the other for disinfectant. Use of chlorine gas reduces the time required to effect bacterial kill. The major portion of the bacteria kill occurs almost immediately (Within 3 seconds). The new disinfection process also shows high potential for virus inactivation. The pump, discharge manifold and jet nozzle of the disinfection unit are furnished completely assembled which makes installation of the equipment in an existing plant a relatively simple process. The pump is lowered into the chamber. Anchors are then placed in the floor and in the wall for mounting the retrieval guide bars for the pump and manifold assembly. Installation of the baffle and reactor tubes is the next step, followed by connection of the disinfectant feed pipes. The use of this injection process in several municipal treatment plants is discussed. The method of disinfectant introduction is critical to the kill efficiency. The more time the disinfectant has to react with species in the water, the less is its toxicity. This method injects molecular chlorine (The most reactive and toxic chlorine species) directly into the turbulent field, dispersing the disinfectant throughout the entire effluent flow. For a very short period, bacteria and viruses are subjected to an acutely toxic environment. (Orr-FIRL)
W76-00204

A BREAKTHROUGH IN SEWAGE TREATMENT...AND THE MAKER'S VIEW.
Water, No 4, p 19, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Energy conservation, Sludge, Economics, Costs, Biological treatment.
Identifiers: *Deep Shaft Process.

ICI's Agricultural Division has developed a revolutionary sewage process called the ICI Deep Shaft Effluent Treatment Process. A deep shaft partitioned into two sections and installed underground forms the basis of the process. Liquid effluent enters the shaft continuously and is circulated around the sections of the shaft repeatedly before overflowing by gravity for solids separation. Compressed air promotes biological oxidation and is the driving force for circulating the liquid effluent. The process should reduce future sewage works to half their normal size, operate them more cheaply, and produce only half of the normal amount of sludge. The process will also improve the environment by placing the major part of the treatment process underground and eliminating smell. The Deep Shaft process replaces the aeration and digestion stages of conventional sewage treatment processes. Considerable energy is saved by the exceptionally good use made of air's oxygen in the process. The depth of the shaft will determine the efficiency of the o ygen transfer. A deeper shaft will provide for mo efficient oxygen transfer. The depth and diame of the shaft will vary to meet the conditions of dividual treatment plants. The problem of sl treatment rates in cold climates would also reduced with the process. (Orr-FIRL)
W76-00207

ALUM VS. PHOSPHATE--WASTEWAT TREATMENT,
Allied Chemical Corp., Morristown, N. J. Indus al Chemical Div.
R. W. Ockershausen.
Water and Sewage Works, Vol 122, No 7, p 80- July, 1975. 2 tabs.

Descriptors: *Nutrient removal, *Coagulati *Waste water treatment, Activated sluc Suspended solids, Biochemical oxygen dema Phosphorus, Capital costs, Aluminum.
Identifiers: *Alum, *Phosphorus remo *Chemical treatment, Coagulants.

Chemical treatment of municipal waste wate discussed. Of the types of coagulants used remove phosphorus, alum is the most popu found in 135 out of the 300 cities in this stu Chemical doses vary, dependent upon the pH the water, colloids present and their electr charges, pollutant load by waste discharges fr industries, amount of groundwater infiltrati and temperature effects. Alum usage in activa sludge plants is compared with doses applie treatment of raw waste water, and to doses trickling filters. The lowest doses are needed in activated sludge plants due to several factors: is lower due to CO2 release, which fa phosphorus removal and coagulation; degree time of mixing can be controlled by moving point of chemical addition in the aeration stage maximum floc formation; and the recycle of tivated sludge containing aluminum values fro previous addition aids in phosphorus remo thus requiring less fresh chemical addit Besides removing phosphorus, clarification alum addition improves suspended solids BOD removals. Capital costs of chemical tr ment are low and operating costs are depen upon the price of the chemicals. (Kramer-FIRL
W76-00209

OZONE STIFLES SEWAGE ODORS IN SIDENTIAL AREAS,
New York City Dept. of Water Resources. St tural Section.
M. Baratt.
The American City, Vol 90, No 8, p 54, Aug 1975. 1 fig.

Descriptors: *Ozone, *Odor, Construction ma als, *Sewage treatment, *Waste water treatm Design criteria, Plastics, Treatment facilities, rosion control, New York.
Identifiers: Polyvinyl chloride, New Y City(NY).

The Manhattan grit chamber treatment fac handles up to 110 mgd raw sewage from se and storm drains from the upper East Side of York City. In the past, odorous air, contai hydrogen sulfide and other chemicals, discharged from the chamber and vented out roof. To eliminate the unwanted odors, treatr with ozone was chosen. Because the weight conventional ozone chamber of steel and conc would be too much for the existing building h ing the grit chamber, and because the steel concrete labyrinth would be too expensive, it necessary to choose another construction mat for the maze. A system of fiberglass-reinfo polyester structural members with corrug PVC panels was selected; structures of Ext were employed, having dual properties of c sion resistance and a high strength-to-weight r New blowers were installed to deliver 67,800

f untreated air per minute to the ozone chamber. lorizontally corrugated PVC panels were ex-ended from a light concrete plank floor up to the uilding roof and were arranged to form a 400 ft ng labyrinth for ozone contact. Ozone may be roduced on site at a rate of 17.5 lb/day and is ixed with polluted air with a 25 second contact me. Purified air is vented to the atmosphere rough a louvered port, eliminating the undesira-le odors to the city. (Kramer-FIRL)
/76-00210

OLYMER APPLICATIONS INCREASING IN /ATER AND WASTE TREATMENT,
. P. Herner.
/ater and Pollution Control, Vol 113, No 7, p 13-4, July, 1975. 3 fig.

escriptors: *Separation techniques, *Polymers, Coagulation, Flocculation, Cations, Dewatering, entrifugation, Filtration, Anions, *Waste water eatment, *Water treatment, Sludge treatment, /ater pollution control, Industrial wastes.
lentifiers: Petrochemicals, Clarification.

he mechanisms and applications of polymers for ater and waste water treatment are discussed. he primary purpose of polymer use is to aid in quid/solid separation processes. Polymers may e used both as primary coagulants and as coagu-nt aids, and have as a function to provide more mplete separation, to increase hydraulic capaci-of operating equipment, or to reduce the mount of chemical solids. The solids separation echanism consists of coagulation, or charge eutralization and microfloc formation, and floc-ulation, or the physical agglomeration of the icrofloc and entrapment of suspended solids. olymers are long chain molecular structures, and ay be anionic or cationic. For use in water clarifi-ation, liquid cationic polymers are useful because ost naturally occuring solids suspended in water ossess anionic surface charges in aqueous spensions. The cationic polymers, by collision, onding, and physical forces, cause the particles coalesce to a size suitable for removal. Another pplication of polymers is in municipal pollution ontrol plants as a replacement for lime or ferric hloride in sludge dewatering. Polymers are also sed in other solids/liquids separation processes to d in primary and secondary clarification, in utriation, and in reduction of suspended solids in gester supernatant. For industrial wastes, olymers may be used for clarification, sedimenta-on, thickening, filtering, dissolved air flotation, nd centrifugation in the paper, petrochemical, ining, refining, and manufacturing industries. Kramer-FIRL)
/76-00212

NEW LOOK AT SEWERAGE AND SEWAGE ISPOSAL.
hartered Municipal Engineer, Vol 102, No 6, p -59, June, 1975. 3 fig.

escriptors: *Sewerage, *Waste water treatment, Sewage disposal, *Sewage treatment, Storm ater, Overflows, Weirs, Industrial wastes, Tex-les, Oil wastes, Methane, Treatment facilities, umps, Equipment.

sues presented at a seminar on 'Modern prac-ces in sewerage and sewage disposal', held in irmingham, Great Britain, are discussed. Design iteria for a foul sewerage scheme were defined concept, capacity, hydraulic design, structural sign, and specification and construction. Storm wage overflow problems were considered, and commendations of a 6 DWF to be used for sign of sewers and the minimum setting of weirs overflow manholes were made. The discharge industrial wastes was also reviewed, including e more biodegradable wastes, such as those om tanneries, farms, and textile industries; the rong, potentially harmful wastes from phar-aceutical, plastics, and petrochemical industries, and the toxic wastes, from chemical, oil, and metal industries. Treatments for each type were recommended. Description of some developments in sewage treatment involved the selection of appropriate standards for treated effluents, needs for seasonal treatment, such as in holiday campsites, and modifications in existing treatment facilities. Recovery of energy as methane from sludge digestion plants was suggested. Also, various equipment, including vacuum and pressure pump tankers, comminuters, and several pumps were described in detail. (Kramer-FIRL)
W76-00213

NEW THERMAL PROCESS FOR PURIFYING WASTE WATERS.
Industrial Heating, Vol 42, No 7, p 32-34, July, 1975. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Sewage treatment, Water reuse, Recycled water, Phosphates, Oil wastes, Organic compounds, Heat transfer, Conservation, Economics.
Identifiers: Zero discharge, *Heat treatment(Waste water), Thermopure process.

The Thermopure Process, developed at Laboratories of Aluminum Company of America (ALCOA), uses waste heat to purify industrial and sewage waste waters. Waste heat is used to concentrate waste products for reuse or simplified disposal and also produces deionized quality water that can be reused. A process description is given. The process employs conventional materials and established engineering technology and operated with low-pressure steam generated preferably by waste heat from various sources. Tests have been conducted using tap water, phosphate wastes, and a variety of oil wastes as feed materials. The thermal processing system is suitable for treating dilute salt wastes. Concentration of dilute acid or caustic wastes for reuse or sale is possible. Many types of oily wastes can be satisfactorily treated and can be reused after filtration. Dilute organic wastes are amenable to the process; the concentrated wastes can be reprocessed or incinerated. Advantages of the process include: production of deionized quality water; concentration of the original dilute waste to normal process levels makes reuse possible, and improves disposal, utilization of waste heat improves the economics of the process; the unit is suitable for unattended operation; and, based on the high quality water, reuse of concentrated waste, recovery of heat and elimination of high cost waste treatment, the process is most economical. The process can be used in a zero discharge system. (Orr-FIRL)
W76-00214

WATER-DISINFECTION CHALLENGERS NOW ON TAP,
For primary bibliographic entry see Field 5F.
W76-00215

CANADA PIONEERS LARGE-SCALE OZONE PLANTS.
Design Engineering, Vol 21, No 8, p 29-31, August, 1975. 1 fig.

Descriptors: *Ozone, *Waste water treatment, *Odor, *Sewage treatment, Municipal wastes, *Canada, Treatment facilities, Computers, Control systems, Filtration, Chlorination, Viruses.
Identifiers: Toronto(Canada), Montreal(Que).

Two very large scale ozone-based facilities are under construction in Canada. These are the Ashbridge Bay odor-control plant in Toronto, and the Baillets filtration plant for water treatment in Montreal. In Ashbridge Bay, the primary odor source is sewage off-gases from the aeration tank. In order to oxidize these odorant gases, the tanks must be covered and ozone gas will then be introduced. Ozone will be generated, introduced into the chamber for contact, and monitored for proper dosage by an automatic control system which is adaptable to full computer control in the future. In the field of municipal water treatment the province of Quebec has already installed 21 ozone treatment facilities. By March 1976, the Baillets facility in Montreal will be the largest existing ozone-based water treatment plant. This facility will eventually treat 500 mgd to serve 88% of the Montreal urban population. The processes used will be filtration, ozonation, and chlorination; the ozone operation consists of pretreatment of the air, ozone generation, and ozone application. Ozonized air will be bubbled into the water at a depth of 24 feet and contacted for a sufficient time to produce an ozone residual of 0.4 mg/liter so that all bacteria and most viruses are destroyed. (Kramer-FIRL)
W76-00216

EXPERIMENTAL STUDY ON DIRECT COAGULATION FILTRATION METHOD. (CHOKUSETSU GYOSHU ROKA-HO NI KANSURU JIKKEN KEKKA),
For primary bibliographic entry see Field 5F.
W76-00217

EXPERIMENTAL STUDIES ON MECHANISM OF FILTRATION IN A MULTILAYER FILTER, (IN JAPANESE),
O. Shinohara, and T. Ueda.
Journal of Japan Water Works Association, No 489, p 2-38, June, 1975. 63 fig, 9 tab, 8 ref.

Descriptors: *Filtration, *Reviews, *Turbidity, *Waste water treatment, Kinetics, Hydraulics, Filters, Head loss.
Identifiers: Japan, Multilayer filters.

A review is presented of studies of filtration using multilayer filters. Comparisons are given of headloss, turbidity of filtered water, load factor of headloss at each depth, and effective filtration time for various filter systems. The mechanisms of filtration for a multilayer filter, including the production of micro-flocs and growth-flocs, are discussed. A determination of optimum values for floc properties, layer composition, and filtration speed may be made. Factors governing effective time are also detailed. (Kramer-FIRL)
W76-00218

AUTOGENUS INCINERATION OF SEWAGE SLUDGE NOW POSSIBLE,
Komline-Sanderson, Ltd. Brampton, (Ontario).
A. Bowser.
Water and Pollution Control, Vol 113, No 7, p 17, 30-31, July, 1975. 3 fig, 1 tab.

Descriptors: *Dewatering, *Waste water treatment, *Sludge treatment, Incineration, Polymers, Flocculation, Sludge disposal, Activated sludge.
Identifiers: Autogenus incineration, Pulped newsprint, Vacuum filtration, Sludge conditioning, Waste activated sludge.

Experimental studies on sludge dewaterability to a level high enough in combustible solids to be autogenously incinerated have been conducted at Hamilton, Ontario. Criteria for a conditioning agent are that it: should be cheap and readily available; have a high heat value, so that final solids concentration required for autogenus incineration is reduced; be able to combine with sludge to allow the mixture to give up its water easily; and, that it should handle easily, without hazards. A material which met these requirements was waste newsprint, which is readily dewaterable in a two-stage process of vacuum dewatering, followed by squeezing in a mechanical rotary press to a high solids concentration. It was found that pulped newsprint could be used to dewater waste activated sludge. Sludge needed to be first flocculated with a polymer, then mixed with the newsprint. A two-stage operation consisted of vacuum filtration to a filter cake of 13 to 15%

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solids (950 BTU/lb) which was then mechanically squeezed to the final product of 25-30% solids (1780 BTU/lb). Filter yield and final solids concentration of the product depend upon the relative amount of newsprint pulp added to the flocculated waste activated sludge. Further laboratory tests showed that raw primary and digested sludges may be similarly dewatered. Ferric chloride and lime conditioning were compared to this proposed use of polymer and newsprint pulp and the latter were seen to produce a sludge with less ash and, a cleaner filtrate, which was more amenable to autogenous incineration. (Kramer-FIRL)
W76-00219

PLAN AND DESIGN OF SLUDGE TREATMENT FACILITIES OF NISHINAGASAWA PURIFICATION PLANT, (IN JAPANESE),
For primary bibliographic entry see Field 5F.
W76-00220

EVAPOTRANSPIRATION POSSIBLE NEW SEWAGE TREATMENT PROCESS.
Journal of Environmental Health, Vol 37, No 5, p 476-477, March-April, 1975. 14 ref.

Descriptors: *Sewage treatment, *Evapotranspiration, Canada, Aerobic conditions, Microorganisms, Land management, *Waste water treatment, *Waste disposal.
Identifiers: On-site disposal.

The use of evapotranspiration for treatment of sewage is discussed. Studies have been conducted in Ontario on the disposal of waste water by infiltration into the soil, whereby foliage of plants takes up water from the soil and it is evaporated into the air. By installing a shallow aerobic seepage bed and planting on top, plants use the wastes as food and water and aerobic microorganisms promote evaporation. In this on-site disposal method, uptake of nutrients by plants occur in the upper four to five feet of soil, and 95 to 97 percent of all pollutants and nutrients should be removed. For an evapotranspiration system (transvap), proper land management is necessary. To ease the load on the system: the ground surface above the bed should arch upward, promoting precipitation runoff; drainage and diversion trenches and grading should be utilized to shield the system from runoff; and shrubs and trees may be planted around the soil absorption area to add to the evapotranspiration capacity. (Kramer-FIRL)
W76-00221

EFFECT OF MEDIA INTERMIXING ON DUAL MEDIA FILTRATION,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. L. Cleasby, and G. D. Sejkora.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE4, p 503-516, August, 1975.

Descriptors: *Waste water treatment, *Water treatment, *Filtration, *Filters, Coals, Sands, Interfaces, Mixing, Efficiencies, Water quality.
Identifiers: *Dual media filters, Media intermixing, Anthracite coal, Silica sand.

Dual media filters composed of anthracite coal over silica sand are widely used in water and waste water treatment. A study was performed to determine if intermixing at the interface of the mediums has any effect on the performance of dual media filters. Performance differences were shown by measurements of headloss development and effluent quality versus time during filtration. Interfacial intermixing did not affect filter performance as measured by both headloss development and effluent quality of dual media filters. The mixed interface filter media produced a higher quality filtrate than did the sharp interface filter media. This was due to substantially finer sand in the mixed interface media. The mixed interface filter media produced higher headlosses than the sharp interface filter media because of the greater suspended solids removal. Intermixing at the interface of dual media filters is unavoidable. It occurs when current media materials are used and sizes are selected to achieve coarse to fine filter media in the direction of flow. A reasonable amount of interfacial intermixing is desirable in dual and multimedia filters to achieve a better quality filtrate. (Orr-FIRL)
W76-00223

WASTEWATER TREATMENT DESIGN: ECONOMICS AND TECHNIQUES, PART I,
Vanderbilt Univ., Nashville, Tenn.
W. W. Eckenfelder, Jr.
Water and Sewage Works, Vol 122, No 6, p 63-65, June, 1975. 6 fig, 2 tab.

Descriptors: *Waste water treatment, *Domestic wastes, *Industrial wastes, Activated sludge, Biological treatment, Biochemical oxygen demand, Temperature, Organic loading, Kinetics, Suspended solids, Biodegradation, Costs.

Specific waste water treatment design considerations are needed in order to economically meet the effluent limitations required by PL 92-500. The effluent quality from a waste water treatment facility will be related to the characteristics of the raw effluent and to the processes used in treatment. There are distinct and major differences between an industrial waste water and domestic sewage. In the treatment of domestic sewage by activated sludge, the colloidal and suspended BOD is bioflocculated and rapidly removed by a physical-chemical mechanism, while the soluble BOD is extracted slowly by a biochemical mechanism. Soluble industrial waste water requires biological BOD removal which is a function of time and concentration. A recently proposed kinetic model defines the performance of activated sludge treating variable strength soluble organic waste waters in terms of influent BOD, soluble effluent BOD, aeration volatile suspended solids, and aeration retention time. The implication of the model is that at a constant organic loading (F/M), the effluent soluble BOD is directly proportional to the influent BOD. Temperature affects the performance of the biological process, since the biodegradation rate is temperature dependent. The important temperature is the temperature in the aeration basin. A thermal balance must be figured considering the ambient air temperature and the influent waste water temperature. To determine the total BOD in the effluent, the contribution from the effluent by suspended solids must be added to the soluble BOD. Increasing the total dissolved solids in the waste water will generally result in an increase in effluent suspended solids. (See also W76-00225) (Orr-FIRL)
W76-00224

WASTEWATER TREATMENT DESIGN, PART II,
Vanderbilt Univ., Nashville, Tenn.
W. W. Echenfelder, Jr.
Water and Sewage Works, Vol 122, No 7, p 70, 75, July, 1975. 2 fig, 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Domestic wastes, Design, Biological treatment, Water quality control, Pre-treatment, Coagulation, Activated carbon, Activated sludge, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: *Physico-chemical treatment.

Increasingly strict water quality standards require combinations of biological, physical and chemical treatment processes. Physical-chemical processes may be used for independent physical-chemical treatment of domestic sewage and certain industrial waste waters or for tertiary treatment following biological treatment processes. Physical-chemical treatment, consisting of pretreatment, chemical coagulation employing lime, iron salts or alum f lowed by granular carbon columns, is highly effe tive for the treatment of domestic sewage. T treatment of industrial waste waters contain high concentrations of soluble organics crea several problems in physical-chemical treatme These can most effectively be treated by a co bination of biological, physical and chemi processes. A number of possible process combi tions are discussed; these may include the addit of powdered carbon to the activated slu process or the use of mixed media filters. Vari process combinations that might be used achieve high quality effluents are presented. T main parameters considered in the combinati include: the BOD removal rate coefficient, k; COD to BOD ratio; and, the total dissolved so in the waste water. When the BOD reaction r coefficient, k, is very low, very long aerat times are required to reduce the soluble BOD levels of 10 mg/liter or less. Cost relationships terms of k and soluble effluent BOD, are gra cally portrayed. Temperature has an important fect on the performance of biological waste wa treatment processes. (See also W76-00224) (O FIRL)
W76-00225

PARTICLES, POLYMERS, AND PI FORMANCE IN FILTRATION,
Quanta Consulting Engineers, Tehran, Iran.
M. R. Habibian, and C. R. O'Melia.
Journal of the Environmental Engineering D sion, Proceedings of ASCE, Vol 101, No EE4 567-583, August, 1975. 9 fig, 2 tab, 24 ref, 2 pend.

Descriptors: *Filtration, *Laboratory te *Waste water treatment, *Water treatme Polymers, Coagulation, Separation techniqu Packed beds, Particles.

The results of laboratory experiments concer with the effects of polymers on the removal of ticles from aqueous suspensions by packed- filters are discussed. The rationale for develop and interpreting the experiments is that coag tion and filtration are quite similar proces Based on results using cationic polymers for filtration of latex suspensions and trickling f effluent, it is concluded that the chemical de bilization necessary for effective filtration similar to that required for effective coagulat Chemicals which are effective in coagulation also effective in filtration. The optimum dose destabilizing chemical in filtration is the sam the optimum dose in coagulation. Standard (coagulation) tests can be used to determine type and amount of chemical needed for de bilization in filtration. Overdosing stoichiometry occur in polymer-aided filtratio well as in polymeric coagulation. The optim polymer dosage was independent of the molec weight of the cationic polymer series te (polyethylenimenes), except for the lo polymer in the series. The removal efficienc filters operated at the optimum dosage increa with increasing molecular weight of the poly employed. For a properly conditioned filter, filter efficiency is independent of the concen tion of suspended materials in the influent. makes the direct filtration of low-turbidity w technologically feasible. The head loss with filter bed varies inversely with the size of the p cles removed from the suspension. (Orr-FIRL)
W76-00229

IRRADIATION OF SEWAGE GAINS D HERENTS,
D. A. O'Sullivan.
Chemical and Engineering News, Vol 53, No 30-31, August 25, 1975.

Descriptors: *Waste water treatm *Irradiation, Gamma rays, Radioisotopes, C radioisotopes, Cesium, *Sewage treatment, Ir

tion, Fertilization, Sewage disposal, Radioactive wastes, *Pilot plants, Treatment facilities.
Identifiers: Electron beam irradiation.

The progress of the use of irradiation for sewage and waste water treatment is discussed. A pilot plant is being installed at Boston's (Mass) Deer Island sewage treatment plant to test the effectiveness of electron beam irradiation in treating municipal sewage. A pilot system is being planned for Fort Belvoir, Va. Tests will examine the feasibility of replacing the secondary treatment with irradiation and will evaluate the use of the resulting sludge as fertilizer. The pilot will use cobalt-60 and then switch to cesium-137 when it becomes more widely available as a waste product from nuclear power plants. Cesium-137 is the preferred radioisotope being studied at Sandia Laboratories in Albuquerque, N.M. Engineers at International Purification Systems Inc., in Atlanta, Ga., are working on a waste water purification system that uses gamma irradiation to regenerate a charcoal adsorbent bed continually. A new treatment system for Monticello, Fla., will involve irradiation to pasteurize waste water from the sewage works so that is can be used safely for irrigation. Engineers at Aqueonic Inc., in Los Altos, Calif., have developed the Biochemrad system which combines primary, secondary, and tertiary sewage treatment in a multistage design. The first commercial sewage irradiation operation started in West Germany in 1973. Currently it is questioned as to whether radioactive isotopes or high energy electron beams are the preferred method of sewage purification. The reasons for either choice are discussed. (Orr-FIRL)
W76-00230

STUDIES ON THE METALLIC ION STIMULATION AND TOXICITY IN SLUDGE DIGESTION,
Dorr-Oliver (India) Ltd., Madras.
K. N. Savalappan.
Journal of the Institution of Engineers (India), Vol 55, Part PH 2, p 51-54, February, 1975. 12 ref.

Descriptors: *Waste water treatment, *Sludge treatment, *Sludge digestion, *Anaerobic digestion, Metals, Sewage sludge, Bacteria, Anaerobic bacteria, Biological treatment, Nutrients, Toxicity, Methane bacteria.

Anaerobic sludge digestion is the anaerobic decomposition of putrescible matter accompanied by gasification, liquefaction, stabilization, and destruction of colloidal structure. The purposes of sludge digestion include: altering the water binding characteristics so that rapid dewatering will result; reducing the initial bulk for economical solids handling; destroying pathogenic organisms for health protection; stabilizing a sufficient fraction of the organic solids so that noxious odors are not produced; and, recovering the methane gas and digested sludge as usable by-products. The three important factors in the process of sludge digestion are the digestion tank, the sewage sludge, and the bacteria. After the sludge is sent to the digestion tank, the organic materials, contained mostly in the solid portion of the sludge, are slowly hydrolized and brought into solution by the bacteria and the enzymes present in the sewage sludge. The importance of enzymes in digestion was discussed. The nutritional requirements of the sewage bacteria were also discussed. An organism in general requires: a source of nitrogen; a source of carbon; inorganic salts; and, a source of energy. It can be assumed that a bacterium will not grow well in the complete absence of all mineral elements. The function of metal ions in bacterial nutrition is similar to the role played by vitamins in human nutrition. The study of the effects of various cations on sludge digestion is extremely important. Stimulation was defined as an increase in the biochemical activity of bacteria over the normal activity due to the addition of any substance. Toxicity or inhibition was a decrease in the biochemical activity. (Orr-FIRL)
W76-00231

ULTRA-HIGH RATE FILTRATION PROBLEMS,
Technical Univ. of Budapest (Hungary).
I. Horvath.
Journal of the American Water Works Association, Vol 67, No 8, p 452-453, August, 1975. 3 fig, 1 tab, 3 ref, 1 append.

Descriptors: *Water treatment, *Filtration, *Hydraulic gradient, Darcys law, Mathematical models, Flow rate, Fluid mechanics, Hydraulic models.
Identifiers: Kozeny-Carman relationships, *High-rate filtration.

The Darcy formula for calculating filtration rate based on hydraulic gradient and the related Kozeny-Carman relationships are not applicable for conditions with a Reynold's number greater than four. Kozeny-Carman equations only apply to the rate range of practical filtration where the rate of filtration is less than 20-25 m/hr. New relationships between rate of filtration and hydraulic gradient have been determined for streamflow conditions within high-rate and filters typical of water treatment plants. The relationship was derived on the basis of analogies between the hydraulic process in porous media and physical analogies based upon Fourier's law, Maxwell's law, and Ohm's law and also an analogy based on transfer streams. The equations represent a hyperbolic relationship between rate of filtration and hydraulic gradient, the controlling factors of which are v sub max, the theoretical maximum value of rate of filtration in meters per hour and I sub sz, a parameter to be determined experimentally, having the character of a hydraulic gradient. These two factors include the influence of all geometrical and physical factors, such as grain size, void ratio, viscosity, density, and temperature, which have a role in the given filtration process. If the hydraulic gradient is much smaller than I sub sz, then the relationships simplify to the Darcy formula. The validity of the derived relationships was verified by experimental proofs from the literature and from the author's experiments. More research is needed to determine a more detailed hydraulic interpretation of the parameters v sub max and I sub sz. (Orr-FIRL)
W76-00234

AEROBIC DIGESTION AND EVAPOTRANSPIRATION IN HOME DISPOSAL SYSTEMS,
S. J. Dea.
Water and Sewage Works, Reference Number, p R76-80, R82, April 30, 1975. 4 fig, 7 ref.

Descriptors: *Waste water treatment, *Waste water disposal, *Domestic wastes, Septic tanks, Design criteria, Evapotranspiration, Plant populations, Percolation, Biological treatment.
Identifiers: *Home disposal systems.

A unique waste water treatment and disposal system for an individual dwelling or home usage is described. The system can be used as an alternate to standard septic tanks which are unsuitable for many soil and geological conditions. The system design includes batch extended aeration, an elevated-mound disposal field and evapotranspiration using native or planted vegetation. The following engineering criteria were used to formulate the system design: the infiltrative surface should be no less permeable than any undisturbed parallel plant within the system; the soil surface should be managed so as to disperse clogging material; there should be no abrupt change in particle size between trench fill or surface cover material and soil at the infiltrative surface; continuous flooding of the infiltrative surface must be avoided; aerobic conditions should be maintained in the soil system; the entire infiltrative surface should be loaded uniformly and simultaneously; and, the amount of suspended solids and nutrients in the applied water should be minimized. Brief descriptions and basic justifications are presented for each of the three distinct component parts of the waste treatment and disposal system: biological treament-batch extended aeration; effluent distribution and percolation; and, soil treatment and evapotranspiration. A cost analysis is given for a three-bedroom home in the Philadelphia, Pennsylvania, suburbs. (Orr-FIRL)
W76-00235

THE ROLE OF MIXING IN EQUALIZATION,
Mixing Equipment Co., Rochester, N.Y.
P. R. Bradley, and J. Y. Oldshue.
Water and Sewage Works, Reference Number, p R173-R177, April 30, 1975. 5 fig, 3 tab.

Descriptors: *Waste water treatment, *Equalizing reservoirs, *Mixing, Equipment, Flow control, Waste dilution, Circulation.
Identifiers: *Equalization basins, Flow fluctuations, Concentration fluctuations.

Proper selection of equalization basin volumes and mixing equipment can reduce the investment and operating costs for physical, chemical, and biological treatment systems, and can produce a system that is less susceptible to upsets and that will consistently provide a better quality effluent than an unequalized system. The hydraulic equalization basin is characterized by a varying flow into the basin and a constant flow from the basin and will dampen out fluctuations in influent stream concentration and flow. The second type of equalization basin contains a constant volume and will only dampen fluctuations in concentration. The most typical type of waste stream is one in which both flow and concentration vary. Equalization of these streams can be effected by either fixed or varying volumes in the equalization basin. Proper installation and baffling of the fluid agitation equipment used to provide mixing in the system is critical to the successful operation of an equalization system. Blending in waste treatment is a flow controlled operation which means that large diameter impellers running at slow speeds require less horesepower for the same degree of blending than do small high speed impellers. For a mixing to operate properly a well baffled system is required in order to make maximum use of the applied power. Correct baffling ensures a uniform fluid regime and provides for a constant and uniform power draw. (Orr-FIRL)
W76-00237

PILOT-SCALE, HIGH-RATE BIOLOGICAL DENITRIFICATION,
Ecolotrol, Inc., Bethpage, N.Y.
J. S. Jeris, and R. W. Owens.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2043-2057, August, 1975. 14 fig, 5 tab, 4 ref.

Descriptors: *Waste water treatment, *Denitrification, Nitrification, Municipal wastes, Nitrogen, Recharge, Groundwater, Water pollution control, *Pilot plants, New York, Treatment facilities, Water reuse.
Identifiers: *Fluidized bed reactor, Nassau County(NY).

A pilot scale fluidized bed reactor was installed at the Bay Park Water Renovation Plant, Nassau County, New York, to denitrify the waste water before disposal of the waste water into the groundwater table. The reactor consisted of five 0.6-cm thick Plexiglas sections 0.46-m in diameter. A 0.3-cm thick steel flow distribution plate was positioned 0.46-m up from the base of the column and covered with 3.8-cm of pea gravel and about one m or 270 kg of white silca sand with an effective size of 0.6-mm and a uniformity coefficient of 1.5. A schematic diagram of the nitrification and denitrification processes is presented. High-rate denitrification in a fluidized bed of sand covered with denitrifying biomass was successfully demonstrated at this moderate sized pilot plant treating 136,000 liters/day. The system consistently produced greater than 99% removal of

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the influent nitrogen in less than 6.5 minutes at a flux rate of 620 liters/min/sq m. The full potential of this system has not yet been determined. The average removal was 5,450 kg. of NO3-N/day/cu m of reactor volume but the system was also able to remove up to 20,700 kg/day/cu m. Nitrogen removal efficiency was not affected by diurnal flow variation and a 17-hour shutdown. The operation routine was simple, trouble-free, and required little time. The removal ability was greater than the concentrations of nitrate-nitrogen that would be expected in a municipal treatment plant. The proven efficiency of this system as well as its low space requirements and ease of operation should make it a viable denitrification alternative method. (Orr-FIRL)
W76-00238

ACTIVATED CARBON: OLD SOLUTION TO OLD PROBLEM, PART I,
ICI United States Inc., Wilmington, Del. Specialty Chemicals Div.
A. D. Adams.
Water and Sewage Works, Vol 122, No 8, p 46-48, August, 1975. 2 fig.

Descriptors: *Waste water treatment, *Activated carbon, Lignite, Sludge treatment, Methane, Sludge digestion, Filtration, Trickling filters, Anaerobic digestion.
Identifiers: Powdered activated carbon.

Laboratory and full scale field trials, conducted from 1972-1974, have shown that the addition of powdered lignite activated carbon to anaerobic digesters will minimize operating problems and lower sludge disposal costs. In the laboratory test, municipal sludge was digested in a batch treatment process and gas evolution was measured. After three weeks, methane production in the digester dosed with lignite carbon was five times that of the control. The first field evaluation was performed at a two mgd trickling filter plant using two stage digestion. Powered activated carbon was added to the primary sludge and supernatant clarity and gas production were monitored. After two weeks, the supernatant clarity had improved measurably, the vacuum filter operation had improved, and the necessity for the use of FeCl3 and lime had decreased. However, the expected increase in gas production did not occur, possibly due to the presence of industrial wastes. Activated carbon was then added to the sludge in a two stage digestion system of a 1.8 mgd trickling filter plant. Clarity of the supernatant improved and gas production increased from an average of 7500 cu ft/day to 11,000 cu ft/day. The third evaluation was performed at a two mgd activated sludge plant with a severely overloaded two stage digestion system. The supernatant improved, gas production increased, and use of vacuum filtration was no longer necessary as a result of the addition of activated carbon. (Orr-FIRL)
W76-00239

UPGRADING LAGOON EFFLUENT FOR BEST PRACTICABLE TREATMENT,
Brown and Caldwell, Walnut Creek, California.
R. W. Stone, D. S. Parker, and J. A. Cotteral.
Journal Water Polltion Control Federation, Vol 47, No 8, p 2019-2042, August, 1975. 16 fig, 9 tab, 11 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Water quality standards, Flotation, Filtration, Nitrification, Chlorination, Algae, Bays, California, *Sewage lagoons, Oxidation lagoons, Pilot plants.
Identifiers: Dissolved air flocation, Gravity filtration, Breakpoint chlorination, *Fixed bed reactors, San Francisco Bay(Calif).

Modeling efforts and studies performed by the University of California's Sanitary Engineering Research Laboratory of Berkeley, state and federal agencies, and engineering consultants have detetermined that the water pollution problems associated with the South Bay segment of the San Francisco Bay system may be mitigated by appropriate control measures such as upgrading existing treatment facilities to a level of quality higher than that defined by federal secondary treatment standards. The potentially feasible alternatives for upgrading the Sunnyvale, California, treatment plant were identified. The apparent best alternative project was determined to be to add fixed growth reactors for nitrification and dissolved air flotation and gravity filtration for alga removal and dechlorination. Pilot plant studies of the tertiary treatment processes identified in the apparent best alternative project were started in spring 1973. Studies were performed on dissolved air flotation, filtration, breakpoint chlorination, and nitrification using fixed growth reactors. Maximum allowable loading rates, chemical requirements, and operational parameters were evaluated for each of the unit processes. A schematic drawing of existing and proposed facilities is presented. (Orr-FIRL)
W76-00240

MEMBRANE PROCESSES FOR WATER TREATMENT, CONCLUSION,
Aberdeen Univ., (Scotland). Dept. of Chemistry.
For primary bibliographic entry see Field 3A.
W76-00241

AN EVALUATION OF THREE COMBINED SEWER OVERFLOW TREATMENT ALTERNATIVES,
Clark, Dietz, and Associates, Urbana, Ill.
J. W. Parks.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-239 115, $5.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-079, December, 1974. 112 p, 32 fig, 20 tab, 2 append. EPA Project 11020 FAM Program Elements 1BP034.

Descriptors: *Waste water treatment, *Sewers, *Overflow, *Combined sewers, *Treatment facilities, Sewerage, Biochemical oxygen demand, Suspended solids, Effluents, Organic matter, Lagoons, Data collections, Hydraulics, Storm runoff.
Identifiers: Wet weather discharge, Organic loading.

Three systems for the treatment of combined sewer overflow in Shelbyville, Illinois, were evaluated for influent and effluent flow, BOD, and suspended solids. These were a single-cell flow-through lagoon, a retention lagoon followed by a two-cell facultative lagoon system and effluent chlorination, and a sedimentation tank with influent chlorination. Each alternative unit was found to be effective in reducing the measured pollutional discharges during wet weather conditions. Partial separation of the combined sewers also was successful in reducing the organic loading during periods of combined sewer overflow. A detailed analysis was presented of the two-cell facultative lagoon as a tertiary treatment system for the existing sewage treatment plant effluent. Data on the operation of the units was collected only during April and May, and it was recommended that these treatment units be further tested for seasonal variation in runoff which might affect unit performance. Design criteria in selecting and sizing combined sewer overflow treatment units should be based on the expected first flush characteristics, runoff intensities, and influent sewer hydraulic capacities. (Kramer-FIRL)
W76-00242

UV-OZONE OXIDATION/STERILIZATION PROCESS,
Westgate Research Corp., Marina del Rey, Calif.
J. D. Zeff, R. R. Barton, B. Smiley, and E. Alhadeff.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as AD/A-0 205, $4.75 in paper copy, $2.25 in microfic Army Medical Research and Development Co mand, Washington, D.C., September, 1974. 89 p fig, 31 tab, 19 ref, 4 append DADA 17-73C-3138

Descriptors: *Ozone, *Ultraviolet radiatio *Waste water treatment, Organic matter, Micro ganisms, Bacteria, Effluents, Temperature, Pr sure, Disinfection.

It has been found that the combination of ozo and ultraviolet radiation for purifying water c taining bacteria and organics is more effect than either treatment alone. A study was c ducted to determine the levels of ozone and u radiation required to destroy predetermined c centrations of microbial contaminants and orga substances in waste water effluents. A stir batch reactor was used for both a microbiologi and an organic study. The microbiological vestigation on E. coli, Streptococcus faeca Klebsiella pneumonia and Acanthamoeba cas lanii showed that the rate of destruction at ro temperature and at 40C were about the same. proximately 0.3 mg/liter of ozone in water was fective in the presence of uv light for two minu or more contact time for disinfection. Test orga Compounds selected were hydroquinone, pyro lol, xylenol, sodium acetate, and urea. A colu reactor with an internally located uv lamp gave best reaction rate and ozone in air plus uv at bient temperature and pressure gave good resu (Kramer-FIRL)
W76-00243

TREATMENT OF SLUDGE FROM SEWERA AND BURNT ASHES,
Environmental Protection Agency, Research angle Park, N.C.
For primary bibliographic entry see Field 5E.
W76-00244

EVALUATION OF A 35-GPH PORTAB DESALINATION PLANT AND CONCEPTU DESIGN OF A 220-GPH CONTAINERIZ PLANT,
Civil Engineering Lab. (Navy), Port Huene Calif.
For primary bibliographic entry see Field 3A.
W76-00245

A PILOT PLANT FOR SEWAGE TREATME BY CROSS-FLOW FILTRATION,
Tennessee Univ., Knoxville. Dept. of Chem Engineering.
J. J. Perona, J. D. Hutchins, A. M. Rom, J. S. Johnson, Jr., and W. G. Sisson.
Available from the National Technical Infor tion Service, Springfield, Va 22161, as ORI TM-4659, $4.25 in paper copy, $2.25 in microfi Oak Ridge National Laboratory, Tennessee, port No ORNL-TM-4659, September, 1974. 20 fig, 1 tab, 1 ref.

Descriptors: *Sewage treatment, *Pilot pla *Waste water treatment, *Treatment facili Municipal wastes, Alkalinity, Filtration, Filt Effluents.
Identifiers: Cross-flow, filtration, Physico-ch cal treatment.

The first six months of operation of a 10,000 pilot plant for treating primary sewage effl from the Oak Ridge municipal plant have successful. The plant operates by physico-ch cal treatment, without biological action, an based on the cross-flow filtration process. process consists of acidification to pH 3 and a tion of iron; holdup with air sparging for one h pH adjustment to 6; and filtration. Five runs made with product fluxes above 100 gal/day for the first 50 hours of operation. Chemical power costs for a large scale process would

ıe range of 35 to 60 cents/gal. Effluent was taken om a primary settler as feed and produced a fil- ate of a higher quality than that obtained by econdary biological treatment. Because the resent filter design would not be applicable for rge scale plant, it is recommended that a filter evelopment program be conducted to implement is method. (Kramer-FIRL)
/76-00246

LABORATORY STUDY OF RDX ADSORP-ION BY CARBON,
rmy Mobility Equipment Research and Develop-ent Center, Fort Belvoir, Va.
G. Vlahakis.
vailable from the National Technical Informa-on Service, Springfield, Va, as AD/A-002 049, 3.75 in paper copy, $2.25 in microfiche. August, 974. 37 p, 18 fig, 4 tab, 2 append.

escriptors: *Waste water treatment, *Water eatment, *Adsorption, *Carbon, Activated car-on, Groundwater, Explosives, Potable water, everse osmosis, Ion exchange, Hydrolysis, hlorination, Polymers, Boiling.
lentifiers: *RDX, TNT, Filtrasorb 400.

two-phase study was performed to investigate eatment methods for the removal of RDX explo-ve (C3H606N6) from contaminated groundwater. he first phase of the program consisted of testing even different commercially available processes: arbon adsorption; reverse osmosis; ion exchange; ydrolysis; boiling; chlorination; and, polymeric dsorption. Carbon adsorption represented the est process for removal of RDX from potable ater based on relative simplicity and effective-ess for domestic use. Adsorption isotherm tests dicate that the maximum theoretical saturation apacity of Filtrasorb 400 is about 0.125 g RDX/g arbon for a feed concentration of 19.5 mg/liter DX. When about 60 mg/liter TNT were added to ıe RDX feed, the RDX saturation capacity was educed 40% to 0.076 g RDX/g carbon. The second hase of the investigation consisted of running mall-diameter-column exhaustion tests using Fil-asorb 400 to determine residence times, carbon apacities, and breakthrough characteristics of the arbon under dynamic conditions. Retention times f 0.92 to 4.90 minutes were studied. For five runs ith flow rates ranging from 0.36 to 1.5 gal/min/sq and feed concentrations from 5.5 to 20.4 mg/liter DX, the adsorption efficiency was directly re-ted to retention time. In competitive adsorption f TNT and RDX, the RDX adsorption efficiency as dependent on the RDX to TNT concentration atio over a narrow RDX concentration range. his is due to the preferential adsorption of TNT. dditional research should be performed to in-estigate a wider range of the experimental arameters in order to facilitate scale-up. (Orr-IRL)
/76-00247

NTERIM REPORT ON TASK FORCE ON HOSPHATE REMOVAL SLUDGES,
nvironmental Protection Agency, Cincinnati, hio. Advanced Waste Treatment Research Lab.
B. Farrell.
vailable from the National Technical Informa-on Service, Springfield, Va 22161, as PB-238 317, 7.25 in paper copy, $2.25 in microfiche. EPA Re-ort, EPA-670/2-75-013, January, 1975. 200 p, 1 g, 2 tab, 15 ref, 10 append. EPA Program Ele-ent 1BB043.

escriptors: *Waste water treatment, *Sludge eatment, *Sludge disposal, *Dewatering, Filtration, Phosphorus, Phosphates, Iron, Alu-inum, Lime, Solid wastes.
lentifiers: Sludge volume, Thickening.

substantial portion of waste water treatment apital and operating cost is due to sludge handling nd disposal. However, information on sludge roduced in conventional waste water treatment is widely scattered and very little information is available on the sludges produced by processes for phosphorus removal. An interim report of a task force on the sludges produced when lime, Fe(+++), or Al(+++) are added for the purpose of P removal is discussed. Most of the information concerns the mass of sludge produced and its filtering properties. The sludges formed when lime is added to waste water have a greater solids content after settling and dewater at greater mass rates than conventional sludges. Conventional sludges are defined as digested total sludge from a conventional primary plus activated sludge plant. Lime sludges produce a much larger mass of sludge per volume of waste water. Sludges formed when Al(+++) or Fe(+++) are added to waste water dewater more poorly than conventional sludges and the sludge solids content is less. The sludge mass produced is higher than that from conventional sludge but lower than that from lime sludges. Sufficient information is not yet available to accurately predict the dewatering properties of iron or aluminum sludges. Research studies and field investigations of the dewatering properties of iron and aluminum sludges are being continued. (Orr-FIRL)
W76-00248

UPGRADING AND EXPANSION OF THE WSCC PISCATAWAY WASTEWATER TREATMENT FACILITY TO 30 MGD AWT, PRINCE GEORGE'S COUNTY, MARYLAND, FINAL ENVIRONMENTAL IMPACT STATEMENT.
Environmental Protection Agency, Philadelphia, Pa. Region III.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 482, $19.25 in paper copy, $2.25 in microfiche. September 16, 1974. 824 p, 23 fig, 25 tab, 12 photos, 11 append.

Descriptors: *Waste water treatment, *Treatment facilities, *Environmental effects, Incineration, Environmental control, Environmental engineering, Maryland.
Identifiers: *Environmental impact statements, *Piscataway Wastewater Treatment Facility(Md), Prince George's County(Md).

The Washington Surbuban Sanitary Commission (WSSC) has applied to the Environmental Protection Agency for federal financial assistance to upgrade the Piscataway Wastewater Treatment Facility to provide advanced waste water treatment (AWT) and to operate at its full 30 mgd capacity. The final environmental impact statement report is presented. The proposed project is an integral portion of a comprehensive program designed to clean up the lower Potomac River and its tributaries. This project would improve water quality in the tributaries to Piscataway Bay. The facility will fulfill the goals of water pollution control without significantly harming other environmental criteria, and will aid in providing a cleaner, healthier environment. The adverse environmental impacts created by the implementation of this program are largely short-term and within acceptable limits. The adverse impacts are associated with construction activities and would result in temporary increased noise levels, disruption of traffic, inconveniences to residents, siltration of streams, disruption to wildlife and wildlife habitat, and slight decreases in ambient air quality in areas close to the construction. The size of the effluent disposal pipe and the proposed method of sludge treatment and disposal are two areas of controversy. The disposal pipe has a larger capactiy than is currently required but this is allowable because it eliminates the necessity for replacing the pipe if the capacity of the plant is increased in the future. The proposed method of disposal, incineration, is still under investigation. Incineration will not be allowed on a routine basis until its environmental effects are known. (Orr-FIRL)
W76-00249

ELECTROCHEMICAL CARBON REGENERATION,
Environics, Inc. Huntington Beach, Calif.
P. H. Owen, and J. P. Barry.
Avialable from the National Technical Information Service, Springfield, Va 22161, as PB-239 156, $3.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-75-028, June, 1972. 43 p, 10 fig. EPA Project 17020 HAL, 68-01-0040.

Descriptors: *Adsorption, *Activated carbon, *Waste water treatment, Municipal wastes, Effluents, Tertiary treatment, Electrochemistry, Water purification, Chemical oxygen demand, Costs, Sewage treatment.
Identifiers: *Electrochemical regeneration, Thermal regeneration, Regenerated carbons.

Experimentation was conducted to investigate a process of electrochemical regeneration of granulated activated carbon spent in the adsorption treatment of municipal secondary effluent. Electrochemically regenerated carbon and virgin carbon were compared by their respective abilities to remove soluble COD organics from sand-filtered secondary effluents during simultaneous dynamic exhaustion. It was found that electrochemical regeneration of granular activated carbon can restore the working capacity for removing soluble COD organics to from 42 to 61% of the capacity of virgin carbon. The 61% of COD capacity electrochemically regenerated is about 77% as good as the average thermal regenerated capacity. As compared to thermal regeneration of carbon, the costs of electrochemical regeneration are much lower. Based on the electrolysis cell energy requirement measured as 15.3 watt hours per gram COD adsorption capacity regenerated, the calculated cost of electrical power to regenerate and rinse the carbon spent in treating 1000 gallons of Lake Tahoe-type waste water was 0.66 cents. This is equivalent to 3.2 cents per pound of carbon at a dosage of 207 lbs carbon per million gallons of effluent. (Kramer-FIRL)
W76-00250

SLUDGE ACTIVITY AND FULL-SCALE PLANT CONTROL,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
P. Coakley, and J. O'Neill.
Water Pollution Control, Vol 74, No 4, p 404-414, 1975. 8 fig, 2 tab, 15 ref, 1 append.

Descriptors: *Activated sludge, *Treatment facilities, *Control systems, Toxicity, *Waste water treatment, Automation, Monitoring, Biological treatment, Biochemical oxygen demand, Analytical techniques, *Sludge treatment.
Identifiers: Dehydrogenase activity, Sludge activity measurement, Triphenyl tetrazolium chloride (TTC).

Three recognized processes in activated sludge treatment are adsorption, flocculation, and biological oxidation. Discussion was given to the mechanism of the initial rapid removal of BOD, with emphasis on microbiological activity. Full-scale activated sludge plant studies indicated a significant increase in the level of dehydrogenase activity, as seen by the production of formazan, as the organic load to the sludge increased. A threefold increase in formazan yield was found to occur within 30 minutes of the addition. Toxic materials in the plant had a major role in the reduction of dehydrogenase activity. These may be measured by a dye such as triphenyl tetrazolium chloride (TTC), which gives early warning of toxic substances not normally monitored. From both full-scale plant and laboratory tests sludge activity measurements (expressed as yield of formazan from TTC/unit weight MLVSS) were shown to have potential for use in activated sludge plant control. Using graphs and tables compiled from plant data for formazan yield under a variety of conditions, a facility operator could assess: the

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ability of an activated sludge to metabolize a particular industrial effluent; whether sludge was underloaded or overloaded; and whether the sludge was affected by a toxic material. It is suggested that many sewage works are equipped to implement this control system, and that the method could be developed for automatic analysis. (Kramer-FIRL)
W76-00252

TREATMENT TRIO TAMES ORGANICS, KILLS BACTERIA.
Chemical Engineering, Vol 82, No 17, p 63, August 18, 1975. 1 fig.

Descriptors: *Waste water treatment, *Ozone, *Activated carbon, Pilot plants, Gamma rays, Treatment facilities, Disinfection, Oxygenation, Organic matter, Operating costs, Bacteria, *Bactericides, *Organic wastes.
Identifiers: Cobalt-60.

An alternative to chlorine disinfection of waste water has been tested, using a combination of gamma rays, ozone, and activated carbon. Compressed air is utilized to agitate waste water in an oxygenation chamber; ozone is then injected in the waste water from the bottom of the chamber. This raises the dissolved oxygen level to about 25 mg/liter, which is necessary to oxidize the organics completely to carbon dioxide and water. Waste water is then pumped from the oxygenation tank to an irradiator/activated carbon hybrid which is filled with activated carbon and has cobalt-60 rods in the center of a column. When organics attach to the column and are irradiated, the dissolved oxygen content drops to two to three mg/liter and color is reduced by 90 to 99%. Ozone is then injected into the discharge line, raising the dissolved oxygen level to about 14 mg/liter. While gamma rays alone kill 99% of viruses and bacteria and ozonization alone kills 95-96%, the synergistic effects of the combination remove practically 100%. A pilot plant has been operated at a 5000 gallons/day poultry processing facility in Marietta, Georgia. Even with influents containing 1150 mg/liter organics, the organics loading has been reduced by 95%. Because the radiation dose concentrates on the organics rather than the whole waste water stream, operating efficiency is higher and costs are lower. (Kramer-FIRL)
W76-00253

HOW TO DESIGN ACTIVATED SLUDGE UNITS,
Fluor Engineers and Constructors, Inc., Los Angeles, Calif. Environmental Engineering Dept.
S. J. Thomson.
Hydrocarbon Processing, Vol 54, No 8, p 99-102, August, 1975. 5 fig, 6 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Design criteria, Industrial wastes, Biodegradation, Sludge, Microorganisms, Temperature, Organic compounds, Nutrients, Oil wastes.
Identifiers: Refineries, Petrochemical industry.

Activated sludge units for treatment of biodegradable substances need to be designed with considerable flexibility because the values of some operation parameters cannot be exactly determined. The consumption of biodegradable materials in aerated activated sludge systems varies with temperature, population of microorganisms, nutrient availability, oxygen supply, and type and concentration of organics in the feed. The design procedure described was developed using pilot and industrial operating data for activated sludge plants in the refining and petrochemical industry but similar design relationships can be determined for the design of units for other industries by similar collection and evaluation of appropriate data. Graphs are presented which show the following operating data: residence time; sludge production; sludge age; and oxygen requirement. Interpretation of the graphs is demonstrated by a sample problem. The steps in the procedure are to: establish the required food to microorganism ratio; determine the required aeration basin volume for a MLVSS concentration of 2,500 mg/liter; calculate the aeration residence time; establish sludge production; check sludge age; establish oxygen requirement; determine design return activated sludge flow; calculate nutrient requirements; and, determine the temperature correction. (Orr-FIRL)
W76-00254

SEWAGE AND EFFLUENT-CHEMICAL ENGINEERING DEVELOPMENTS ON THE WAY,
P. Butler.
Process Engineering, p 85-87, June, 1975. 5 fig, 1 tab.

Descriptors: *Waste water treatment, *Chemical engineering, *Sewage treatment, Industrial wastes, Equipment, Activated sludge, Oxygen.
Identifiers: Physico-chemical treatment, ICI deep shaft process, Oxygen-activated sludge, Alwatech process, Alwafloc process, Catalytic oxidation.

New chemical engineering processes for effluent treatment are discussed. The ICI deep shaft aeration process for treating both sewage and industrial effluents is an air-lift type of fermenter, in which the air for biological oxidation also provides the driving force for liquid circulation. A pilot plant is now in operation at the Billingham sewage works, United Kingdom. Satec, U. K., (an Air Products Subsidiary) has been working on a pilot plant program for oxygen-activated sludge treatment. Research has been conducted on both mixed and staged variants of oxygen-activated sludge systems. The Rotapur process consists of physico-chemical treatment followed by catalytic oxidation. This process has been applied to sewage treatment, textile effluent treatment, pig slurry, industrial waste waters containing phenol, and gas cleaning/odor control. The Alwatech process is a purely physico-chemical method of treating food industry wastes combined with protein and fat recovery. The Alwatech process combines precipitation of the protein and/or fat with dissolved air flotation to bring the solids to the surface of the liquor where they can be skimmed off. The Alwafloc process for fat recovery treats waste water with trivalent metallic ions under acid conditions, followed by the addition of calcium ions to raise the pH and an anionic polyelectrolyte to strengthen the floc. The Alwatech process has been used in treating wastes from slaughter houses and poultry processing plants. The Alwafloc process has been used for effluents from poultry plants, margarine and edible oil plants, and in the petrochemical industry. (Orr-FIRL)
W76-00255

POLIOVIRUS INACTIVATION BY ACTIVATED SLUDGE,
Texas Univ., at Austin. Dept. of Civil Engineering; and Texas Univ. at Austin. Dept of Environmental Health Engineering.
J. F. Malina, Jr., K. R. Ranganathan, B. P. Sagik, and B. E. Moore.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2178-2183, August, 1975. 6 fig, 2 tab, 10 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Viruses, Disinfection, Sludge disposal, Monitoring, Viricides, Sewage treatment, Public health, Diseases, Epidemiology, Microbiology.
Identifiers: *Poliovirus.

An evaluation of the permanent inactivation of virus in the activated sludge process was performed. Activated sludge was inoculated with tritium-labeled poliovirus in batch reactors, and the fate of the virus was followed by tracing the radioactive label and infectivity with time. The initial total virus in the systems was 4.8 times ten to the tenth power PFU. The initial adsorption of 1.9 times ten to the ninth power PFU/g of sludge w followed by a period of no significant reduction the titer in the supernatant. The decrease in infe tivity titer of the supernatant after a period of o hour followed the empirical relationship: the init virus concentration in the supernatant per gram initial MLSS (PFU/ml-g) equals the virus conce tration in the supernatant at any time t (PFU/ml times the time in minutes raised to a constant 0.32. The results indicate that some of t poliovirus adsorbed to the activated sludge par cles is inactivated and that virus particles that not infective may be released into the supernata However, the association of virus particles w sludge and the fact that infectious virus partic can be eluted from sludge solids must be co sidered in evaluating sludge disposal alternati and in virus monitoring techniques proposed sewage treatment plant effluents. (Orr-FIRL)
W76-00256

INTERMITTENT SAND FILTERS FOR U GRADING LAGOON EFFLUENTS,
Utah Water Research Lab. Logan.
J. H. Reynolds, S. E. Harris, D. Hill, D. S. Filip, and E. J. Middlebrooks.
Public Works, Vol 106, No 9, p 91-94, Septemb 1975. 1 fig, 2 tab, 5 ref.

Descriptors: *Waste water treatment, *Lagoo *Filters, Water quality, Suspended soli Biochemical oxygen demand, Chemical oxy demand, Sands, Filtration, Sewage lagoons.
Identifiers: *Intermittent sand filters, Hydrat loading rate.

An experimental full-scale plant was built at lagoon treatment plant of the City of Logan, Ut to test the effectiveness of intermittent sand filt for polishing lagoon effluents. The facility c sisted of six filters, each 25 by 36 feet and conta ing three feet of pit-run concrete sand with an fective size of 0.17 mm and uniformity coeffici of 9.7. Data were collected and analyzed hydraulic loading rates ranging from 0.2 mgad 1.2 mgad. T alga genera present in the lagoon fluent had little effect on the performance of intermittent sand filters. The length of the fi run was directly related to the influent algal c centration and hydraulic loading rate. The efflu total suspended solids concentration increa slightly with an increase in the hydraulic load rate. When the average influent volatile suspen solids (VSS) concentration was 16.9 mg/liter, filters produced an effluent with less than mg/liter of VSS. The intermittent sand fi produced a consistent effluent BOD of less tha mg/liter and filtered effluent BOD and COD crease slightly with an increase in the hydra loading rate. The influent ammonia-nitrogen c centration were reduced from 2.5 mg/liter to than 0.54 mg/liter. The pH values of filter efflu were approximately 8.0 but ranged between and 8.9. The full-scale filter rests essenti duplicated the performance of laboratory and p scale tests. (Orr-FIRL)
W76-00257

AMMONIA REMOVAL-WHAT'S BEST,
Calgon, Corp., Pittsburgh, Pa. Wastewater Ap cations Research.
D. Mioduszewski.
Water and Wastes Engineering, Vol 12, No 7, p 36, 38, 40, 45-46, July, 1975. 4 fig, 2 tab.

Descriptors: *Waste water treatment, *Ammo Ion exchange, Denitrification, Nitrificat Chlorination, Activated carbon, Nitrogen, Co Cost comparisons.
Identifiers: *Air stripping, Breakpoint chlor tion, Chloramines.

The relative advantages and disadvantages of different processes for ammonia removal are c pared on an equivalent technical and econo basis. Ammonia removal by ion exchange invo

the displacement by ammonium ions of some other cation from an insoluble exchange medium. Natural zeolite, such as clinoptilolite, has shown the best selectivity for ammonia. The success of the clinoptilolite process is greatly dependent on the development and demonstration of an economical, practical, and environmentally sound method of recycling the regenerant. Two methods of treating the regenerant are ammonia stripping to the atmosphere or to recovery systems and breakpoint chlorination. Nitrogen removal can be achieved biologically through the processes of nitrification and denitrification. In the nitrification process, ammonia is oxidized aerobically to nitrite and then to nitrate. The denitrification step removes the nitrogenous oxygen demand; nitrate is anaerobically converted to nitrogen gas. The three major types of process configurations for nitrification-denitrification are combined sludge, separate sludge, and submerged filter systems. The air stripping process for ammonia removal involves raising the pH of the waste water to 10.5 to 11.5 and providing sufficient air-water turbulent contact and air flow to strip the ammonia gas from solution. Chlorination of waste water results in an increase in chloramine species up to a maximum after which the concentration of chloramines falls to a minimum which is termed the breakpoint. Addition of activated carbon to the process as a catalyst/dechlorinator seems to concentrate the oxidizing power of the applied chlorine. Air stripping is the least expensive treatment methods; ion exchange with regenerant recovery is the most expensive. (Orr-FIRL)
W76-00258

SEWAGE TREATMENT AND DISCHARGE INTO TROPICAL COASTAL WATERS,
University of the South Pacific, Suva (Fiji). School of Natural Resources.
For primary bibliographic entry see Field 5E.
W76-00259

SHALLOW DEPTH SEDIMENTATION-A RATIONAL APPROACH TO WATER AND WASTEWATER CLARIFICATION,
National Environmental Engineering Research Inst., Nagpur (India).
R. Paramasivam, and P. S. Kelkar.
Journal of the Institution of Engineers (India), Vol 55, Part PH 2, p 46-50, February, 1975. 6 fig, 2 tab, 21 ref.

Descriptors: *Waste water treatment, *Water treatment, *Sedimentation, Settling basins, Hydraulics, Suspended solids.
Identifiers: *Tube settlers, *Clarification, *Shallow depth sedimentation.

The development of the shallow depth sedimentation principle is discussed. Diameter, specific gravity, shape and concentration of particles as well as temperature and tank hydraulics influence the settling characteristics of particles. The efficiency of sedimentation is dependent mainly on the surface loading or the tank overflow rate rather than on depth or detention time. One of the first (1915 patent) shallow depth sedimentation designs involved several shallow settling compartments formed by a series of conical circular trays placed one above the other. In the 1960's, the successful application of shallow depth sedimentation using small diameter (2.5-10.0 cm) tubes as settling devices was demonstrated. The two basic tube configurations are essentially horizontal and steeply inclined. Tube configurations meet the requirements of shallow depth, laminar flow conditions and reasonable overflow rates. The performance of the settlers depends largely upon the tube design. The tube height should be as short as possible to minimize the settling distance. Tube shape should permit nesting to eliminate waste space between tubes in a unit. Three proprietary tube settler units are described. Tube settlers are being employed at water treatment plants to reduce detention time or to increase capacity. Settling tubes used for the clarificcation of raw and trickling filter effluents were found to increase the capacity of existing clarifiers or improve the performance of poorly operating units. (Orr-FIRL)
W76-00263

SEWAGE TREATMENT TO MEET TOMORROW'S NEEDS,
G. A. Truesdale, and M. R. G. Taylor.
Water and Pollution Control, Vol 74, No 4, p 455-565, 1975. 1 fig, 2 tab, 34 ref.

Descriptors: *Waste water treatment, *Sewage treatment, Treatment facilities, Sewage works, *Biological treatment, Costs, Water reuse, Water demand, Potable water, Irrigation, Filtration, Lagoons, Nitrification, Denitrification, Activated carbon, Membrane process.
Identifiers: *Physico-chemical treatment, *United Kingdom.

To meet the probable increase in water demand in the UK, it will be necessary to increase abstraction from rivers, resulting in an increase in the volume of sewage effluent requiring disposal and a reduction in the volumes of water in the rivers for diluation of this increased volume of effluent. Therefore, more stringent standards for sewage effluents will be required to protect potable water supplies. Processes that can be used to achieve higher effluent standards are discussed. The processes assume that sewage treatment will still be based on conventional biological methods with a combination of biological and physico-chemical methods were appropriate. The costs are based on 1971 conditions. Tertiary treatment processes discussed include: irrigation over grasslands; slow and filtration; retention in lagoons; rapid sand filtration; microstraining; gravel bed clarifiers; and, nitrification, denitrification, and phosphate removal methods. Water reclamation processes include: activated carbon adsorption; ion exchange; electrodialysis; reverse osmosis; and thermal processes such as multistage and multiple effect evaporation. The capital expenditure on sewage treatment in the UK has risen from 20 million pounds in 1950 to 160 million pounds in 1973. It currently amounts to more than 0.5% of the gross national product of the UK. (Orr-FIRL)
W76-00264

AERATION PLANT DESIGN: DERIVATION OF BASIC DATA AND COMPARATIVE PERFORMANCE STUDIES,
R. B. Badger, D. D. Robinson, and R. J. Kiff.
Water Pollution Control, Vol 74, No 4, p 415-429, 1975. 2 fig, 17 tab, 3 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Activated sludge, Design criteria, Laboratory tests, Pilot plants, Aeration.
Identifiers: Aerators.

A single-stage activated sludge plant employing vertically-mounted mechanical aerators was chosen as the most economical method of expanding the waste water treatment facility at Rodbourne, U.K. An experimental program was conducted to establish comparative operating data for four configurations of activated-sludge processes. The configurations were: single pocket completely mixed; two pocket series flow; four pocket series flow; and, interseries flow which comprises two pockets completely mixed followed by two pockets series flow. Bench-scale tests were performed on all configuratins. The interseries system proved to be the most ideal layout for effective bioflocculation. The Rodbourne sewage was easily treated by activated sludge; a low residual COD concentration and full nitrification were effected. A pilot-scale test was conducted using the interseries flow configuration. This experimental program identified the most stable mode of operation and provided a large amount of information on the variables involved. An assessment of the mean values and standard deviation for independent process variables was made to ensure that the plant will be able to comply with effluent standards 90 percent of the time. (Orr-FIRL)
W76-00265

'CATTY' ODOURS IN SEWAGE WORKS,
Thames Water Authority, London (England). Metropolitan Public Health Div.
J. V. Stedman, and P. J. Matthews.
Water Pollution Control, Vol 74, No 4, p 471-473, 1975. 8 ref.

Descriptors: *Waste water treatment, *Odor, *Sewage treatment, *Industrial wastes, Hydrogen sulfide, Sewage works.
Identifiers: 4-methyl-4-mercapto-pentan-2-one, Mesityl oxide.

'Catty' odors have been reported at industrial slag heaps and sewage treatment plants, in an industrial effluent, and in food storage. The 'catty' odor has been shown to be due to 4-methyl-4-mercapto-pentan-2-one, which results from a reaction between mesityl oxide and hydrogen sulfide. An investigation was conducted to determine the mechanism by which 4-methyl-4-mercapto-pentan-2-one could give rise to 'catty' odors at sewage works. The following conclusions were reached. Mesityl oxide reacts with hydrogen sulfide in crude sewage sludge to produce 4-methyl-4-mercapto-pentan-2-one which has a strong 'catty' odor. The sludge must be relatively fresh with a pH close to 6, and must have available sulfide present. If the pH of the sludge is higher than 6, then in the presence of sulfide, the threshold level of mesityl oxide for odor development may be as low as 0.01 mg/liter. If the 'catty' odor results from the caustic demethanolation of pentoxone, then the problem may be solved by replacing this solvent with methyl isobutyl carbinol. This implies that the presence of compounds, such as pentoxone, which may be precursors to mesityl oxide must be prevented to avoid the 'catty' odor in industrial waste water, sewage, and sewage sludge. (Orr-FIRL)
W76-00266

THE PERFORMANCE OF FULL-SCALE SLUDGE FLOTATION PLANT,
M. L. Burfitt.
Water Pollution Control, Vol 74, No 4, p 474-475, 1975. 1 tab, 2 ref.

Descriptors: *Sludge treatment, *Flotation, *Waste water treatment, *Sewage treatment, Treatment facilities, Suspended solids, Activated sludge, *Performance.

Operating data from the largest sludge flotation plant currently installed on a sewage works in the United Kingdom is presented. The sewage treatment plant at Aycliffe, UK, was expanded in 1972 for a dry-weather flow of 24,000 cu m/day and a population equivalent of 132,000 persons. Surplus activated sludge is consolidated in two 23 sq m flotation units prior to mixing, further consolidated with primary sludge, and subsequently digested and filter pressed. Using the flotation technique, a surplus activated sludge containg 5000 mg/liter suspended solids can be thickened to yield a sludge which contains 4.0% dry solids. The flotation technique is very efficient; it can remove 99.6% of the influent suspended solids. Due to the current excess capacity in the plant, the sludge loading rate has been slightly reduced to produce a thicker sludge float one-ninth of its original volume. (Orr-FIRL)
W76-00267

OBSERVATIONS ON THE PERFORMANCE OF POLISHING LAGOONS AT A LARGE REGIONAL WORKS,
Water Pollution Research Lab., Stevenage (England).

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I. P. Toms, M. Owens, J. A. Hall, and M. J. Mindenhall.
Water Pollution Control, Vol 74, No 4, p 383-401, 1975. 14 fig, 9 tab, 28 ref.

Descriptors: *Lagoons, *Sewage treatment, *Suspended solids, Biochemical findings, Oxygen demand, Bacteria, Nitrates, Retention, Effluents, *Waste water treatment, Phosphorus, Performance.
Identifiers: Phosphorus removal, Effluent polishing.

The use of lagooning as a polishing process was considered, in terms of number of lagoons, their retention periods, and depths required. Generally, except for the removal of phosphate and ammonia, it was found that several lagoons in series are better than a single lagoon of the same total retention period. The lagoons at Rye Meads Sewage Purification Works, Great Britain, were used for this study with the following conclusions. While lagooning of sewage effluent can be an efficient process for reducing suspended solids, BOD, fecal bacteria, nitrate, and phosphate, many of the required performance characteristics are not compatible. Thus, for the removal of the maximum amounts of ss, BOD, and fecal bacteria, lagoons should be operated in series. Because the growth of phytoplankton increases ss and BOD and reduces the mortality of fecal bacteria, it should be minimized by using a total retention period of up to four days in small consecutive lagoons. Fecal bacteria removal (due to amount of daylight) will be greatest in summer; in short-retention series lagoons, ss removal is not dependent upon the season. Conditions which favor the maximum removal of nitrate are the exposure of water to a maximal surface of mud. Removal rates up to 0.8 g N/sq m day are expected when denitrification is performed at the mud/water interface. Maximum phosphorus removal is possible when algae populations are at their maximum; their growth increases the pH of the water and causes precipitation of P as hydroxyapatite. While this algal growth occurs most rapidly during long (10 days or more) retention periods in single shallow lagoons in the summer, unacceptable ss and BOD may result. All of these findings are applicable to the 'polishing' of almost fully nitrified effluents. (Kramer-FIRL)
W76-00268

WASTEWATER SOLIDS SEPARATION,
P. N. Cheremisinoff, and S. M. Feller.
Pollution Engineering, Vol 7, No 8, p 26-33, August, 1975. 9 fig.

Descriptors: *Separation techniques, Filters, Filtration, *Waste water treatment, Diatomaceous earth, Screens, Sands, Equipment, Water treatment, Clarification, Settling basins, Particle size, Lagoons.
Identifiers: *Suspended solids removal, Rotary screens, Rapid sand filters, In-depth filters.

Various types of equipment for the removal of suspended solids from water and waste water are detailed. New methods meet high-level treatment requirements for nonbiodegradable wastes, independent of living organisms. The new systems described maintain predictable control and absorb shock loads with minimal effects on effluent quality. Screening equipment includes rotary screens to remove coarse solids from waste water; static screens emply a large screen surface at a steep angle so that dewatered solids travel down the surface of the screen into a sump; vibrating screens trap solids which are moved to the periphery of the screen element for disposal; microstrainers use a drum mechanism covered with a special weave fabric to separate small suspended particles. Of the many types of existing filters, the surface-contact type, or slow sand filters; sit on a system of collection and drainage pipelines; rapid sand filters are also surface filtration devices which are composed of a layer of graded sand supported on layers of graded gravel, some with coagulants added in a rapid mixing basin; moving bed filters are a continuous rapid sand type filter with a counter-current sand and influent flow directipon; in-depth filters are an improvement on the rapid sand filter, with a gradation of grain size from coarse to fine in the direction of the flow. Other separation techniques are diatomaceous earth filtration, a type of mechanical separation, and grass plots used as a system when effluents are irrigated over grasslands. Lagoons and oxidation ponds, settlers, thickeners, and clarifiers, are also described and illustrated. (Kramer-FIRL)
W76-00271

CURRENT TRENDS IN PACKAGED WASTEWATER TREATMENT FACILITIES, PART I,
New Jersey Inst. of Tech., Trenton. Dept. of Civil and Environmental Engineering.
R. Dresnack, and W. Miller.
Water and Sewage Works, Vol 122, No 8, p 60-63, August, 1975. 5 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Biological treatment, Organic wastes, Microorganisms, Activated sludge.
Identifiers: Contact stabilization systems, Completely mixed systems, Package plants.

A state-of-the-art report is presented on package waste water treatment plants. The advantages, disadvantages, process variations and cost variables of package plants are discussed. Performance data and a selection guide are also included. Package plants can be classified as using either biological or chemical treatment methods. There are significant differences among package plants using biological processes. The basic difference between the systems is the manner in which the required hardware is assembled. The digestion of organic wastes by microorganisms in the contact stabilization process is a two step process. In step one, the microorganisms consume the organic wastes. Metabolic digestion or biochemical breakdown of the material consumed occurs in step two. Two configurations of package contact stabilization units that are commercially available are a circular plant and a rectangular plant with a mechanical sludge handler. Completely mixed activated sludge systems operate as homogeneous systems where the organic waste is well mixed with the seed sludge during aeration. Many variations in size, shape and operational features can be found among completely mixed systems. (Orr-FIRL)
W76-00272

HOW CAN YOU COPE WITH SHORTAGES.
New York City Dept. of Water Resources.
For primary bibliographic entry see Field 5F.
W76-00282

WATER-QUALITY REQUIREMENTS FOR THE CHEMICAL INDUSTRY,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
A. W. Fynsk.
Journal of the American Water Works Association, Vol 67, No 2, p 65-66, February, 1975. 4 tab, 2 ref.

Descriptors: *Waste water treatment, *Chemical wastes, *Water quality standards, *Chemical industry, *Water utilization, *Consumptive use, Non-consumptive use, Cooling, Recirculated water, Standards, Water demand, Water treatment, Recycling, Boiler feed water, Corrosion, Industrial water.
Identifiers: Cascading.

The chemical industry is diverse. There are 27 different classifications of product lines defined by the Bureau of Census for the chemical industry. The industry uses about 4500 billion gallons per year. The water is used in the following percentages: cooling-80%, process-16%, and steam production, sanitation and potable water-4%. Consumption of water is only 9% of the water intake and further treatment of water is given to only 13% before use. Water quality requirements for cooling and industrial boiler feedwater are given. Most of the water used does not meet Drinking Water Standards (EPA). Recycling and cascading of water is feasible in many cases and will increase in use as the competition for available water supply grows and the costs of water supply and disposal increase. (NWWA-Bradbeer)
W76-00284

PLASTIC OUTFALL LAID EXTRA DEEP.
For primary bibliographic entry see Field 5E.
W76-00343

PUMPING APPLICATIONS...SEWAGE, SLUDGE, AND SLURRY,
For primary bibliographic entry see Field 8C.
W76-00344

BIOLOGICAL TREATMENT OF EFFLUENT WITH ROTATING DISCS.
French Patent FR 2240-190. Issued April 11, 1975.
Derwent French Patents Report, Vol W, No 21, p 4, July, 1975.

Descriptors: *Patents, *Biological treatment, *Bacteria, *Waste water treatment, Equipment, Waste treatment, Aerobic treatment, Oxygenation, Effluents.
Identifiers: *Rotating discs.

A plant for the biological treatment of effluents using rotating discs was patented. These discs are partly immersed to provide growth support surfaces for bacteria which are alternately immersed in and withdrawn from liquid to be treated as the discs rotate. Thus, a disc carries on one or both faces one or more bundles of open-ended tubes. Discs are designed in sectors, made of polyvinyl chloride sheets set between radial, metal spoles set at less than 180 degrees to each other, bounded by a metal rim. Each sector carries a tube bundle. The plant purifies sewage or polluted effluents by an aerobic method employing contact with the discs on which bacteria are grown. Oxygenation of the bacteria is highly efficient as the disc rotates, as a result of the slight compression within the tubes as they are submerged and become filled with liquid followed by slight under-pressure as the discs rotates and the tubes are emptied. (Kramer-FIRL)
W76-00345

WASTE WATER PURIFICATION USING ACTIVE CARBON AND ASH.
French Patent FR 2241-502. Issued April 25, 1975.
Derwent French Patents Report, Vol W, No 22, p 8, July, 1975.

Descriptors: *Patents, *Waste water treatment, *Adsorption, *Activated carbon, Recycling, Sludge treatment, Dewatering, Sewage treatment, Waste disposal, Water purification.
Identifiers: Pyrolysis, Waste reuse.

A patent was issued for a method of waste water purification which uses activated carbon and ash obtained by pyrolysis of previously precipitated and skimmed off organic matter from processed sewage. Sludge from one settling tank is dewatered by filtration and the resulting almost dry solids are processed in a reactor. Some of the activated carbon and ash mixed with fresh water from this reactor is fed to the liquid in a second settling tank which receives the partially clarified water from the first process. After adsorption of the organic matter in this tank, sludge is pumped into a mixer in front of the first settling tank so that its adsorptive capacity may be utilized. Because of this recycling of the waste product, disposal of less than 0.1% of the original solids is necessary. (Kramer-FIRL)
W76-00346

ERTIARY TREATMENT OF WASTE WATER
ITH OZONE AND ULTRASONICS.
elgian Patent BE-821-971. Issued May 7, 1975.
erwent Belgian Patents Report, Vol W, No 21, p
July, 1975.

escriptors: *Patents, *Ozone, *Waste water
eatment, *Flocculation, *Polyelectrolyses,
perating costs, Capital costs, *Tertiary treat-
ent, *Ultrasonics.
lentifiers: Multi-stage waste water treatment.

multi-stage waste water treatment was patented.
waste water is treated with a coagulating
gent; treated with a polyelectrolyte flocculating
gent; and passed through a laminar flow separat-
g cell, where clarified liquid rises between close-
spaced plates and the bulk of residual solid im-
rities settle out. The resultant clarified liquid is
avitated by ultrasonic energy, and, while in this
ate, is contact-treated with ozone. Two sources
f ultrasonic energy should be used, one operating
a frequency of no more than 30 kHz, and the
her being at least twice the frequency of the
rst. Ozone contact takes place in a counter-cur-
nt column with the gas rising through descending
arified liquid. Thus tertiary treatment produces a
ery high standard of treated effluent and offers
ptimum economy of investment and low operat-
g costs. (Kramer-FIRL)
76-00347

ILTER FOR PURIFICATION OF WASTE
ATER.
rench Patent FR 2241-499. Issued April 25, 1975.
erwent French Patents Report, Vol W, No 22, p
8, July, 1975.

escriptors: *Patents, *Filters, *Sewage treat-
ent, *Waste water treatment, Microorganisms,
ludge treatment, Biological treatment, Water pu-
fication, Filtration.
lentifiers: *Biological filters.

filter for purification of waste water or sewage
as patented. Sewage is allowed to trickle over a
lter bed in order to build up a layer of sludge and
icroorganisms. Grains cover the filter bed and
re circulated from time to time, so that the sludge
removed. Sludge removal efficiency is increased
hen the waste water is distributed uniformly over
ie whole of the filter bed by rotating distribution
rms. The washing arms rotate around two pipes;
ne admits compressed air to aerate the biological
yer and the other evacuates the treated sludge.
irculation of the filter grains prevents clogging by
fficiently detaching the sludge from the grains.
Kramer-FIRL)
76-00348

XYGEN DISSOLVING UNIT FOR AN AC-
IVATED SLUDGE PLANT.
etherlands Patent NL 7413-332. Issued May 9,
975. Derwent Netherlands Patents Report, Vol
, No 21, p 1, July, 1975.

escriptors: *Activated sludge, *Patents, *Waste
ater treatment, Reservoirs, Aerobic conditions,
xygen, Effluents, Treatment facilities, Dissolved
xygen.
lentifiers: *Oxygen dissolving unit, Package
eatment.

patented oxygen dissolving unit for an activated
udge plant is described. The apparatus is con-
ined in a tank with an inlet for incoming ef-
uents. The unit can be installed as a package
ongside a reservoir and is used to raise the
iological activity and thus the efficiency of aero-
ic purification of the waste water. Incoming ef-
uents may be pumped via a static mixing zone to
receiving zone beneath a gas space created by
ie pressurized oxygenating gas. From these, ox-
gen is dissolved in the static mixing zone into tur-
ulent effluent and the de-oxygenated gas has a
ent to the atmosphere. The receiving zone also has an outlet for oxygen- enriched effluent to return to the reservoir. Construction of the compact unit is inexpensive, and the directional adjustability of the outlet promotes optimum aerobic and circulatory conditions for activated sludge. (Kramer-FIRL)
W76-00349

SINGLE BASIN AERATED SEWAGE LAGOON WITH SPRING TIME INTENSIFIED AERATION,
Atara Corp., Montreal, (Canada). (Assignee).
D. S. Murphy.
United States Patent 3,897,334. Issued July 29, 1975. Official Gazette of the United States Patent Office, Vol 936, No 5, p 1834-1835, July, 1975. 1 fig.

Descriptors: *Sewage treatment, *Patents, *Aerated lagoons, *Waste water treatment, *Aeration, Sewage lagoons, Temperature control, Equipment.
Identifiers: High intensity aeration, Aerators.

A sewage treatment method was patented which consists of introducing raw sewage from an inlet at one end of a lagoon, passing this sewage through the lagoon in a flow path, and removing treated effluents at an outlet at the opposite end of the lagoon. Sewage is treated in a first zone of high intensity aeration by several densely disposed aerators located in rows across the flow path in the lagoon adjacent to the inlet, and is further treated in a second similar zone, where a second set of aerators are less densely disposed than the first. Sewage is then fed to a third zone of high intensity aeration with the group of aerators being more densely disposed than the second multiple; treated sewage is passed through a further zone between the third multiple of aerators and an outlet, through a zone without aerators. Thus, as sewage is passed from the first to the third multiple of aerators, the air supply to the first and second multiples of aerators is maintained and the air supply to the third set of aerators is controlled. The third group of aerators are capable of providing a zone of final high intensity aeration in the sewage being treated, and include a temperature control switch connected so that the conduits to the third mutiple of aerators are closed when the temperature in the lagoon falls below about 10C. (Kramer-FIRL)
W76-00350

SYNTHETIC SURFACTANTS IN URBAN EFFLUENTS AND THEIR RATE OF ELIMINATION IN BIOLOGICAL WASTEWATER TREATMENT PLANTS (SINTETICHSKIE POVERKHNOSTNOAKTIVNYE VESHCHESTVA V GORODSKIKH STOKAKH I EFFEKTIVNOST' OCHISTKI OT NIKH NA BIOLOGICHESKOY STANTSII),
Y. I. Kostovetskiy, G. M. Rakhov, and Y. I. Shteynberg.
Gigiyena i Sanitariya, No 2, p 95-96, 1975. 1 tab 3 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Surfactants, Coagulation, Filters, Aeration, *Biological treatment, Municipal wastes, Effluents.

The efficiency of biological waste water treatment plants in the elimination of synthetic surfactants from municipal waste water was studied. Mechanical settling reduced the surfactant concentration, ranging from 2.2 to 5.3 mg/liter originally, by 5-16%, while biological coagulation increased the elimination rate to 30%. Biological filters and aeration tanks had efficiencies of 40-48% and 47-78.3%, respectively. The overall efficiency of biological waste water treatment plants ranged from 48 to 80%, depending on the initial concentration and on the efficiency of the mechanical purification stage. Surfactant concentrations up to 10 mg/liter did not interfere with the operation of biological ponds. (Takacs-FIRL)
W76-00351

ONE-STEP NITRIFICATION AND CARBON REMOVAL,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
E. L. Stover, and D. F. Kincannon.
Water and Sewage Works, Vol 122, No 6, p 66-69, June, 1975. 4 fig, 2 tab, 9 ref.

Descriptors: *Nitrification, Ammonia, Nitrogen, Chemical oxygen demand, *Waste water treatment, Microbial degradation, *Biological treatment, Carbon.
Identifiers: *Rotating biological discs process, *Carbon removal.

The rotating biological disc process has been shown to be very effective for biological nitrification. A two-year study from 1972 to 1974 was performed to determine the ammonia-nitrogen characteristics of a rotating biological contractor system operated at COD and NH3-N concentrations comparable to those of domestic waste water. Ammonia-nitrogen removal characteristics for shock loads were also studied. The principle of the rotating disc system is that the discs are partially submerged in waste water and the microbial population is passed alternately through waste water and air. The discs provide media to support fixed microbial growth, contact the growth with the waste water, and aerate the waste water to provide enough dissolved oxygen for aerobic biological activity. It was found that the system achieved complete nitrification at a hydraulic loading of 0.5 gpd/sq ft and influent COD and NH3-N concentration of 250 mg/liter and 27.6 mg/liter, respectively. The first stage removed 82 percent of the ammonia-nitrogen, with all removed by the fifth stage. The majority of the COD was removed in the first stage of the rotating disc unit. Shock load experiments showed that ammonia-nitrogen removal increased with increased COD and NH3-N concentrations because ammonia-nitrogen could be incorporated into cellular matter instead of oxidized to nitrate-nitrogen. Variables affecting nitrification capacity of the process were seen to be temperature, pH, presence of inhibitors, total applied loading, and the COD or BOD to NH3-N ratio. (Kramer-FIRL)
W76-00352

AN EXPERIMENT OF RAPID FILTRATION THROUGH DUAL-MEDIA BED FOR SECONDARY TREATMENT EFFLUENTS (NISO ROKA NI YORU NIJI SHORISUI NO ROKA JIKKEN),
T. Yoda.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol 12, No 132, p 54-63, May, 1975. 10 fig, 2 tab, 11 ref.

Descriptors: *Waste water treatment, *Filtration, Coals, *Tertiary treatment, Turbidity, Biochemical oxygen demand, Biological treatment.
Identifiers: Sand.

Tertiary treatment of sewage water by a two layer filtration technique is studied. The filtration layers considered were sand with a 0.58 mm effective radius, anthracite with 1.0 mm or 1.2 mm radius, and the combination of sand and anthracite used in equal amounts for a total bed thickness of 600 mm. The cross section of the filtration bed was 0.63 sq m, and six of such filtration beds were used to treat the water after second stage treatment. The six filtrations beds were combined at each bed outlet and the water filtered by each was mixed and discharged. The turbidity and BOD value of the filtered water were less than 6 and 8, respectively, for the sample water. The turbidity was 24 and BOD 28, at a filtration rate of below 600 m/day. The pH of the filtered water showed a slightly higher value than that of the unfiltered water; the former pH ranged from 7.25 to 7.80 and the latter ranged from 7.16 to 7.50. The best combination of layers was sand with the 1.2 mm radius anthracite. (Katayama-FIRL)
W76-00353

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PURE OXYGEN TREATMENT OF WASTE-WATER,
FMC Corp., Itasca, Ill.
R. H. Stetzer.
Pollution Engineering, Vol 7, No 5, p 42-45, May, 1975. 4 fig, 1 tab.

Descriptors: *Oxygenation, *Biological treatment, *Waste water treatment, Biochemical oxygen demand, Chemical oxygen demand, *Aeration, Pilot plants, Suspended solids, Treatment facilities.
Identifiers: *Pure oxygen treatment.

Pure oxygen systems are compared with conventional air activated sludge methods for biological treatment of waste water. Advantages of oxygenation are high removals of BOD, COD, and suspended solids, at reduced costs. A pure oxygen system using a diffuser design with operation in an open aeration tank has been developed. Oxygen dissolution generates micron-sized bubbles deep in the mixed liquor, producing oxygen transfer efficiencies over 90 percent. Uncovered tanks have no enclosed pure oxygen atmosphere and thus require no alarms. These tanks allow the CO2 gases to escape to the atmoshpere, resulting in a high pH in the mixed liquor, which is advantageous for nitrification. Automatic control is maintained by a system of dissolved oxygen probes and analyzers. Pilot facilities of pure oxygen are in operation at treatment plants in Englewood and Denver, Colorado. This system may be used to upgrade existing facilities, often without tank modification. (Kramer-FIRL)
W76-00354

AN ASPECT OF THE SOLIDS RETENTION TIME CONTROL IN THE ACTIVATED SLUDGE PROCESS (KASSEI ODEN PUROSESU NI OKERU YOJO ODEN NO HAISHUTSU),
R. Ota.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol 12, No 133, p 52-57, June, 1975. 4 fig, 2 ref.

Descriptors: *Activated sludge, *Mathematical studies, *Waste water treatment, *Sludge treatment, Water quality control, Treatment facilities, Chemical precipitation.
Identifiers: *Japan, *Solids retention time(SRT), *Solids removal.

The sludge retention time (SRT) and total sludge quantity in a precipitation pool are considered mathematically based on the Walker's SRT Controlling Equation. The effects on water quality of periodic and nonperiodic sludge removals from the precipitation pool which may be governed by SRT control are considered as they relate to the sewage treatment plant at Fukashiba, in the Ibaragi Prefecture of Japan. Since the spread of sludge particle movement is faster than that of water, the sludge precipitation process is dependent upon the capacities of the aeration and precipitation pools for calculation of the volume of activated sludge. The concept of SRT control for water quality is not applicable to controlling total sludge quantity, and the SRT values must be determined empirically for each individual plant. The SRT value at the Fukashiba plant was estimated to be about 65 days, which was larger than the value estimated by Walker of 5 to 10 days for municipal waste water. However, the Fukashiba plant was treating large amounts of waste water from the petrochemical industry. Periodic or continuous removal of excess sludge from the precipitation pool gave a stable quality to the treated water, with the standard deviation of COD as 4 mg/liter, while non-periodic removal gave a deviation of between 12 and 29 mg/liter. (Katayama-FIRL)
W76-00356

EPA CREATES NEW SEWER AND PLANT INDEXES.
Engineering News Record, Vol 194, No 25, p 73-74, June 19, 1975. 2 tab.

Descriptors: *Construction costs, *Sewerage, *Waste water treatment, *Treatment facilities, Municipal wastes, Data processing, Computer programs, Model studies.
Identifiers: *Cost indexes.

A set of three municipal treatment plant and sewer project construction cost indexes is being published by the Environmental Protection Agency. These have been developed by the ICARUS Corporation and replace previous EPA indexes. The three basic indexes are large city advanced treatment (LCAT), small city conventional treatment (SCCT), and complete urban sewer system (CUSS). The indexes were computed on the basis of current technology, labor productivity, and vendor profits. Model plants which served as a basis for each index were constructed from a data base which is continually updated as innovations cause changes in the costs of various factors. In the case of the LCAT index, component configurations for a model 50 mgd and a model 5 mgd facility were selected, including bar screen, grit chamber, primary clarification, activated sludge, lime clarification, multi-media gravity filtration, chlorination, gravity thickening, vacuum filtration, and multiple hearth incineration. A computer program was then used to design a model plant, identifying major cost elements. For LCAT, these were: equipment (17.2% of total cost); civil material and labor (35.4%); piping material and labor (10.3%); electrical material and labor (2.7%); and construction overhead (22.5%). Index equations were formulated by finding those materials and/or wage rates that would typify the movement of a particular cost component. A profit adjustment factor and a productivity factor were included in this calculation. For creating the SSCT and the CUSS indexes, similar procedures were applied. (Kramer-FIRL)
W76-00358

TRACE ELEMENTS IN CORN GROWN ON LONG-TERM SLUDGE DISPOSAL SITE,
National Environmental Research Center, Cincinnati, Ohio, Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5B.
W76-00359

INSTRUMENTATION AND AUTOMATION OF WASTEWATER TREATMENT SYSTEMS, (LITERATURE REVIEW),
National Environment Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. F. Roesler, and R. H. Wise.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1369-1381, June, 1975. 136 ref.

Descriptors: *Automation, *Instrumentation, *Waste water treatment, *Reviews, Analytical techniques, Monitoring, Measurement, *Control systems, Computers, Pollutant identification, *Treatment facilities, *Bibliographies.
Identifiers: Process stream analyzers, Sensors.

Recent literature on automation systems for waste water treatment systems and on related instrumentation is reviewed. Process stream analyzers and sensors have been designed to measure substrate, physical and chemical properties, suspended solids, and biological activity. Monitoring of organic loads in waste water process streams by instrumented on-line analyses of total carbon, total organic carbon (TOC), and total oxygen demand (TOD) rather than by manually determined BOD is discussed. Widespread usage of on-line commercially available process stream analyzers is expected over the next ten years. These include equipment for monitoring nitrate-nitrite, ammonia, orthophosphorus, and total hydrolyzable phosphorus. Current techniques involving continuous pressure sensors are reviewed, including applications in flow and level measurements, density, viscosity, consistency, and leak detection. Advantages and disadvantages of various automatic control systems for waste water treatme processes are detailed. Mathematical models ar control strategy simulations may be used to pr dict system responses. Available microcompute and minicomputers for programmed data acqui tion and operational control were also surveye (Kramer-FIRL)
W76-00364

POSSIBILITIES OF WASTE WATER IRRIGATION IN FORESTS (MOEGLIHCKEITEN DE ABWASSERVERREISELUNG IN WAL BESTAENDEN),
Goettingen Univ. (West Germany).Inst. of S Science and Forest Nutrition.
U. Sommer, and H. W. Fassbender.
Allgemine Forstzeitschrift, Vol 30, No 22, p 46 471, June, 1975. 5 tab, 3 ref.

Descriptors: *Irrigation, *Waste disposal, *S chemistry, *Forests, Crops, Plastic pip Phosphorus, Alaklinity, Groundwater, Pub health, Soil analysis, Nitrogen, Environmental fects.
Identifiers: *Germany, Land application.

Studies of soil chemical composition and hygie investigations concerning waste water irrigation forests have been made. Untreated waste wa generated in the towns of Wolfsburg a Braunschweig, Germany, is discharged o croplands in summer, and in coniferous forest winter through percolation by means of mova plastic pipes. Investigations of soil samples fr the forests after percolation of waste wa revealed a significantly increased phosphorus c tent, and an increased soil pH due to increa sodium and calcium levels. However, most of calcium and magnesium inputs are adsorbed humus. Groundwater samples were seen to c tain no pathogenic germs, due to rapid decomp tion in the soil. The nitrogen concentrations of groundwater were below the maximum allowa level. Waste water irrigation caused the posit growth of young trees, and made the species co position of the udergrowth more variega (Nave-FIRL)
W76-00366

PLANNING AND CONSTRUCTION OF SEW AND DRAINAGE SYSTEMS (PLANNING U BAU VON KANALISATIONS--UND ENTWA SERUNGSANLAGEN),
W. Kiefer.
Technische Mitteilungen, Vol 68, No 5, p 159- May 1975. 5 fig, 13 ref.

Descriptors: *Storm runoff, *Waste water tr ment, Overflow, Rainfall, Planning, Sewer Sewers, *Drainage systems, *Treatment facili Storm water, Mathematical studies.
Identifiers: Storm retention basins, Rain yi Reinhold's curves.

General principles and problems of the plan and construction of sewer and drainage syst are presented. Runoff as a basis for the dimens ing of sewer systems may be calculated from pirical values as a function of both the numbe inhabitants and of the water infiltration, which function of the age of the sewer system. Storm noff is usually calculated on the basis of R hold's rain yield curves. The critical rain yie taken to be 15 liters/sec, which implies that a m larger quantity of water is to be fed into the w water treatment plant, and that the facility w require the use of additional storm overflow storm retention basins. (Nave-FIRL)
W76-00367

ANOTHER LOOK AT THE NRC FORMULA
California Univ., Davis. Dept. of Civil Engi ing.
E. D. Schroeder, and G. Tchobanoglous.

Water and Sewage Works, Vol 122, No 7, p 58-60, July, 1975. 2 fig, 8 ref.

Descriptors: *Trickling filters, *Mathematical models, *Design criteria, Filters, Biochemical oxygen demand, Biological treatment, *Waste water treatment, Filtration.
Identifiers: NRC formula, Goodness-of-fit.

The (National Research Council) (NRC) formula on which a design model for trickling filters has been based was critically examined. The model was devised by NRC's Committee on Sanitary Engineering, Subcommittee on Sewage Treatment in Military Installations. While this model is widely accepted, data for the formula were obtained over thirty years ago. The equation of best fit was stated as: E (or percent efficiency)= 100 (weight of BOD removed by the filter and clarifier/weight of BOD applied including recycle). This was also expressed as E = 100/(1 + 0.0085 times the square root of (the weight of BOD5 per day/gross volume in acre feet x the number of passes through the filter)). When the NRC formula was developed, its two constraints were that efficiency was forced to be 100% when the loading rate was zero, and that recycling trickling filter effluent was assumed to be beneficial. When alternate methods of fitting curves through the data were considered, there was no fit found for which the quality was particularly good. The formula neglects differences in temperature, waste water constituents, media characteristics, and other factors, and considers only volumetric flow rate, BOD5, and filter volume. Thus, in designing a trickling filter, it was suggested that the engineer not use the NRC formula as a standard, but rather test any new facility by a pilot plant study. (Kramer-FIRL)
W76-00368

RECLAMATION OF METAL VALUES FROM METAL-FINISHING WASTE TREATMENT SLUDGES,
Battelle Columbus Labs., Ohio.
A. B. Tripler, Jr., R. H. Cherry, Jr., and G. R. Smithson, Jr.
Available from the National Technical Information Service., Springfield, Va. 22161 Environmental Protection Agency Cincinnati, Ohio, Report EPA-670/2-75-018, April 1975. 88 p, 8 fig, 17 tab, 50 ref. 1BB036;ROAP 21 AZO;TASK 11, 12010FXD.

Descriptors: Industrial wastes, *Waste water treatment, *Sludge, *Metal finishing, *Materials recovery, Electrowinning, Ion exchanginhg, Sludge disposal, Waste treatment.
Identifiers: *Waste metal recovery.

Efforts have included the determination of the worth of recovering metal values from metal-finishers' wastewater treatment sludges, the definition and research of processes for such recovery, and the selection, design, and costing of a recommended process. The study included a survey of the literature to determine the state-of-the-art regarding the generation, disposal, and recovery treatment practices relevant to metal-finishers' sludges, and to identify metal recovery processes possibly applicable to those sludges. This information was supplemented with a survey by questionnaire to determine the current status of relevant practices and conditions. Field investigations provided detailed examples of plant practices, sludge storage conditions, and sludge characteristics. The extraction of metal values from waste sludges by various leaching agents, and the recovery of metal values by techniques including electrowinning, cementation, and liquid-liquid ion exchange were studied. A portable pilot process for the treatment of waste sludges and recovery of metal values was selected and equipment and operating costs developed. (EPA)
W76-00370

BENCH-SCALE HIGH-RATE DISINFECTION OF COMBINED SEWER OVERFLOWS; WITH CHLORINE AND CHLORINE DIOXIDE,
O'Brien and Gere Engineers, Inc. Syracuse, N. Y.
P. E. Moffa, E. C. Tifft, Jr., S. L. Richardson, and J. E. Smith.
Available rom the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Cincinnati, Ohio. Report EPA-670/2-75-021, April 1975. 180 p, 48 ref. 1BB034; ROAP 21-ASY; Task 124. S-802400 (11020 HFR).

Descriptors: Urban areas, Storm runoff, Sewage, *Overflows, *New York, Tests, *Screenings, *Disinfection, Bactericides, *Combined sewers, Chlorine, *Waste water treatment, Laboratory tests, Viricides.
Identifiers: *High-rate treatment, Combined sewer overflows, Suspended solids removal, *Chlorine dioxide, Onondago County(NY).

A bench-scale study of high-rate disinfection of combined sewer overflows with chlorine and chlorine dioxide was performed to aid in the design and operation of full-scale prototype treatment facilities. Four logarithm reductions in three indicator bacteria and several common viruses were obtained with 25 mg/l chlorine or 12 mg/l chlorine dioxide in two-minutes contact time. Sequential addition of disinfectants enhanced the process such that only eight mg/l of chlorine followed in 15 to 30 seconds by two mg/l chlorine dioxide were necessary to obtain similar reductions. The removal of suspended solids by microscreening through a 23 micron aperture had little effect on disinfection efficiency. Disinfection increased slightly with increased temperature, and a study of the receiving waters indicated no bacterial or viral aftergrowth. Adenosine triposphate (ATP) was found to be a possible alternative to the bacterial indicators of disinfection efficiency and microbial contamination. Electron spin resonance (esr) was used as a primary standard method for quantitative measurement of chlorine dioxide residuals. (EPA)
W76-00371

PHYSICAL AND SETTLING CHARACTERISTICS OF PARTICULATES IN STORM AND SANITARY WASTEWATERS,
American Public Works Association, Chicago, Ill.
R. J. Dalrymple, S. L. Hodd, and D. C. Morin.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Cincinnati, Ohio. Report EPA-670/2-75-011, April 1975. 32 p, 14 fig, 8 tab, 31 ref, 3 append. 1BB034; ROAP 21-ASY; Task 107. 68-03-0272.

Descriptors: Regulations, *Waste water treatment, *Overflows, *Separation techniques, Hydraulic models, Particle size, *Combined sewers, *Settling velocity, Waste treatment, Storm Water, Model studies.
Identifiers: Solids separation, Overflow quality, *Particulate density, *Swirl concentrator.

An investigation was conducted, as part of model studies utilizing a swirl concentrator as a primary separator, helical combined sewer overflow regulator, and related studies, to characterize the properties of solids in sanitary sewage, combined sewer overflows, and stormwater runoff. Material suitable for monitoring efficiencies in hydraulic models of the swirl concentrator unit has been developed. The approach taken by Beak Consultants, Ltd., serving as a subcontractor to the American Public Works Association in the simulation sewage studies, was to match as closely as possible the settling characteristics of solids in three types of sewage and/or urban runoff with a well-defined, uniform artificial test material. An Amberlite Anion Exchange Resin (IRA-93), when ground and sieved to between 74 and 149 microns, was found to closely simulate the settling characteristics of domestic sewage. This material is of uniform density and appears to react according to Stokes' law for spherical particles at this size range. Arizona Road Dust, between 10 and 20 microns, was found to exhibit a similar-settling velocity distribution to that of the colloidal (or semi-colloidal) components of sanitary sewage flow. This report on these studies recommends that either or both of these materials be used in the scale-model efficiency trials. As background information for the selection of syntheszied solids, the settling characteristics (including size and specific gravity distribution) of sanitary sewage, combined sewer overflow and stormwater were determined. These values will be useful for future determinations of physical treatment process design and associated treatability. (EPA)
W76-00372

NUTRIENT TRANSFORMATIONS IN A SWINE WASTE OXIDATION DITCH,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
P. H. Jones, and N. K. Patni.
Journal Water Pollution Control Federation, Vol 46, No 2, p 366-379, February 1974. 16 fig, 4 tab, 20 ref.

Descriptors: *Waste water treatment, *Phosphorus, *Nitrogen, Design, Swine, *Oxidation lagoons, Farm wastes, Hogs, Nutrients, Confinement pens.
Identifiers: Oxidation ditch, Land disposal, *Swine wastes.

Livestock production in confined areas is rapidly gaining popularity in North America as well as in Europe. Of the various possible systems for the treatment and handling of high-strength animal wastes, oxidation ditches are especially attractive because of their simplicity and economy. Jones, Patni and others have established the efficiency of oxidation ditches in reducing oxygen demanding carbon. This seven month study examines the behavior of nitrogen and phosphorus in such units. Nitrogen loss from the ditch was inhibited after about 20 weeks of operation as indicated by nitrogen accumulation in the ditch mixed liquor (DML). It seems that the nitrofication-denitrification scheme was disturbed by the introduction of wood shavings in the DML beginning about this time. It is concluded that, with proper design and operation, oxidation ditches can be used to effect a high degree of nitrogen removal from high-strength animal wastes. The study also indicated that controlled and regulated land application of the animal wastes treated in oxidation ditches (containing the accumulated phosphorus) seems at present to be the most practical way of preventing phosphates from reaching groundwater at animal waste treatment facilities. (Kehl-East Central Oklahoma State)
W76-00429

AGRICULTURAL RESEARCH CONCENTRATES ON FARM WASTE.
For primary bibliographic entry see Field 5G.
W76-00430

PRINCIPLES OF NUTRIENT CONTROL FOR AGRICULTURAL WASTEWATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-00431

TREAT YOUR WASTE RIGHT,
G. Warren.
Soil Conservation, Vol 38, No 6, p 130-132, January, 1973. 3 fig.

Descriptors: *Waste treatment, *Waste disposal, *Sewage, *Louisiana, *Lagoons, *Streams, Water pollution, *Farm wastes, *Waste water treatment.

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Rural Louisiana is freeing its streams and countryside from sewage, garbage, and animal wastes. The Soil Conservation Service in cooperation with the Louisiana State Board of Health provides technical help in designing and constructing sewage lagoons and animal-waste systems. The SCS is called on for soil maps and interpretations to help locate sites for both types of systems. A sewage lagoon system at Coushatta not only costs about one-tenth of what a treatment plant costs but it also keeps the sewage from going into the Red River. More than 150 animal-waste systems have been built in the state by dairymen. This type of waste no longer goes into the streams; it goes into the lagoon. (Cameron-East Central Oklahoma State)
W76-00432

TAKING CARE OF WASTES FROM THE TROUT FARM,
R. Jenson.
National Fisherman, Vol 52, No 9, p 15-A, February, 1972. 9 fig.

Descriptors: *Fish hatcheries, *Trout, *Water pollution, *Settling basins, *Waste disposal, Solid wastes.
Identifiers: *Fish wastes, Solids removal.

After development of obnoxious conditions in the Jordan River near a picnic area, the Jordon River Watershed Committee asked the Jordan River National Fish Hatchery near Alba, Michigan to correct the undesirable river conditions. It was determined that solid wastes from the hatchery were causing the problem. After studying solids removal attempts of Lamar National Fish Hatchery Development Center in Lamar, Pennsylvania, the Jordan River National Fish Hatchery set about designing its own settling basin. Important factors to be considered were retention time, weight of wet solids, water velocity and distribution, and depth of water. The final design consisted of two compartments, each of which had two trenches connected to a manhole pump which would separate and trap the solids. The wastes were then to be disposed of in one of the following ways: (1) as direct applied land fertilizer, (2) in a sewage disposal system, (3) as raw material for commercial fertilizer, (4) by transfer to a municipal sewage plant, or (5) by incineration. (Merryman-East Central Oklahoma State)
W76-00433

DAIRY WASTE MANAGEMENT ALTERNATIVES,
North Carolina State Univ., Raleigh.
B. L. Carlile, S. H. Dobson, L. B. Driggers, J. M. Falter, and G. J. Kriz.
Cooperative Extension Work in Agriculture and Home Economics. North Carolina State University at Raleigh, (1973). 38 p, 4 fig, 15 tab.

Descriptors: *Liquid wastes, *Solid wastes, Agricultural runoff, Lagoons, Irrigation, Drying, *Waste water disposal, Dairy industry, Chemical properties, Odor, Pests, Costs, Economics, *Farm wastes, Waste water treatment.
Identifiers: *Waste management, *Land spreading, Refeeding, Composting, Application rates.

This bulletin is designed to help dairy producers meet environmental limitation problems in the most practical and economical way. The first section deals with alternative waste management systems and their various components. Also included are sections on storm runoff control and parlor and milkhouse waste water control. Requirements and methods are given for preventing feedlot runoff and milkhouse waste water from reach surface waters. A utilization and land requirements section presents guidelines and examples of how much waste can be applied per acre. Odor control and pest control sections provide suggestions and methods for reducing odor and pest problems. An economics section gives cost data and contains a partial budget sheet so that comparisons between the alternative waste management systems can be made. (Cartmell-East Central Oklahoma State)
W76-00434

EUTROPHICATION IN THE GREAT PLAINS,
Oklahoma Cooperative Fishery Unit, Stillwater.
For primary bibliographic entry see Field 5B.
W76-00437

FARM EFFLUENT--ELECTRICAL DISPOSAL METHODS,
F. Barrett.
Effluent and Water Treatment Journal, Vol 11, No 4, p 207-209, April, 1971. 1 fig.

Descriptors: Effluents, *Farm wastes, Suspended solids, *Waste disposal, *Waste water treatment, *Oxidation lagoons, *Flotation.
Identifiers: *Electrical disposal methods, *Stabilization ponds, Oxidation ditch, *Electrolytic flotation.

The growth of more intensive stock farming has added urgency to the search for efficient, economical and acceptable methods for the disposal of farm effluents. Research has indicated that effluent from a herd of 90-100 cows can be dealt with efficiently and economically by spray aeration in a two section stabilization pond. Pig effluent can be made relatively innocuous by treating it aerobically in an oxidation ditch so that its oxygen demand is materially reduced by biological action. It is a process that avoids odor problems and which requires much less land for the disposal of the residue than would be required for untreated effluent. Electrolytic flotation using hydrogen and oxygen produced by the electrolytic breakdown of a small portion of the water in the effluent to raise the solids to the surface is a suitable low-cost method of overcoming most of the difficulties in the removal of suspended solids from effluent. (Cameron-East Central Oklahoma State)
W76-00438

LAND DISPOSAL OF LIVESTOCK WASTE,
Maryland Univ., College Park. Co-operative Extension Service.
For primary bibliographic entry see Field 5E.
W76-00440

LAGOONS FOR ANIMAL WASTE DISPOSAL,
Auburn Univ., Ala. Cooperative Extension Service.
For primary bibliographic entry see Field 5E.
W76-00441

EVALUATION OF METHODS FOR THE ANALYSIS OF PHYSICAL, CHEMICAL AND BIOCHEMICAL PROPERTIES OF POULTRY WASTEWATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
T. B. S. Prakasam, E. G. Srinath, P. Y. Yang, and R. C. Loehr.
Presented at Special Meeting, American Society of Agricultural Engineers Committee SE-412, Chicago, Illinois, December 12, 1972, 71 p. 9 fig, 16 tab, 15 ref.

Descriptors: Research and development, *Analytical techniques, *Poultry, Physical properties, Chemical properties, *Waste water treatment, Farm wastes, Nitrogen, Odor, Pollutant identification, Water pollution sources.
Identifiers: *Biochemical properties, *Nitrogen control, *Odor control.

Research and demonstration studies were conducted on the treatment of poultry wastes for the past four years with particular emphasis on nitrogen control, waste treatment, and odor control. This research involved the analysis of raw and treated wastewater. Analytical methods were evaluated for their applicability to the routine analysis of animal and especially poultry wastewaters. Objectives of this research were to discuss the results of these investigations and to indicate satisfactory methods for the analysis of physical, chemical, and biochemical properties of poultry wastewaters. Samples of excreta voided from chickens housed at the Poultry Research Farm, Cornell University were used. The various methods used for the analysis of raw and treated poultry wastewater are described. (Cameron-East Central Oklahoma State)
W76-00442

CONTROLLING MANURE RUNOFF,
Pennsylvania State Univ., University Park.
A. R. Grout.
Feedlot Management, Vol 16, No 6, p 34-35, 38, June 1974. 1 fig.

Descriptors: *Agricultrual runoff, *Feed lots, *Slurries, *Liquid wastes, Lagoons, Basins, Methane Costs, Odor, Waste water treatment, Waste disposal, Oxidation lagoons, Dewatering.
Identifiers: Runoff control, Evaporation ponds, Composting.

There are several ways in which feedlot runoff may be controlled. Slurry manure can be stored in an open basin. Because this material will not stack, the walls must be high enough and strong enough to hold the semi-liquid manure inside. Solid manure from a bedded barn of partially dried manure from a feedlot can be stored with a stacker unit in a basin. In liquid manure systems slotted floors or concrete slabs can be used for removal of manure, and problems due to cold weather. Agricultural runoff can be reduced by roofing, diversion channels, and efficient evestrough systems. Detention ponds for runoff should be built according to state guidelines. Lagoons or stabilization ponds can cause a partial break down of manure nutrients in water. In oxidation ditches liquid manure is circulated and aerated in a race track shaped basin by a paddle wheel or propeller. Evaporation ponds reduce the amount of water for disposal, but are limited to areas of low humidity and rainfall. Composting and dewatering of solids is being practiced in some areas. Prodution of methane gas from animal manure by anaerobic digestion is another disposal alternative. (Cartmell-East Central Oklahoma State)
W76-00444

THE DESIGN AND OPERATION OF AN OPEN FRONT, SLOTTED FLOOR BEEF CONFINEMENT BUILDING,
Illinois Univ., Urbana. Cooperative Extension Service.
M. D. Hall, and F. McRoberts.
Presented at 1969 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 9-12, Paper No. 69-911, 3 p.

Descriptors: *Design, *Confinement pens, Cost, Waste disposal, Ventilation, Cattle, Agricultural runoff, Fertilizers, Performance, *Operation, Waste treatment, Farm wastes.
Identifiers: *Waste management, Feeding systems, Slotted floor.

In using confined feeding systems, practically all feeders are looking for the same thing: (1) profit on animals going through the system, (2) minimum labor and management requirements, (3) minimum odor and waste disposal problems, and (4) provision of a market for feed that is not easily marketable. There are four basic components to any feeding system that must be fit together: (1) feeding system, (2) waste disposal system, (3) environmental system, and (4) animal handling syste. The system studied was designed with a bunk feeding system. The waste disposal system consisted of

tted floor with a pit under it to catch the waste
d pumps to remove it. The main objective with
e environmental system used was to prevent
afts, keep the cattle dry in the winter, and pro-
le good shade with the best natural ventilation
ssible. Performance of cattle in the open-front
nfinement cattle barn was excellent when com-
red to with cattle in conventional feedlots. No
nificant health problems were experienced with
e inside or outside cattle, and the open-front
lar-type beef barn should work well in almost
y climate with minor changes. The manure was
ncentrated with no runoff, allowing maximum
e of manure as fertilizer and also allowing con-
l of ground water pollution to some extent.
attles-East Central Oklahoma State)
76-00447

)MMERCIAL FEEDLOTS-NUISANCE, ZON-G AND REGULATION,
r primary bibliographic entry see Field 5G.
76-00449

MMONIA REMOVAL FROM AGRICUL-RAL RUNOFF AND SECONDARY EF-UENTS BY SELECTED ION EXCHANGE.
ttelle Memorial Inst., Richland, Wash. Pacific
rthwest Labs.
ailable from the National Technical Informa-
n Service, Springfield, Va 22161 as PB-187 759,
00 in paper copy, $2.25 in microfiche. Federal
ater Pollution Control Administration, Cincin-
ti, Ohio, Robert A. Taft Research Center Report
. TWRC-5, March, 1969, 58 p. 19 fig, 7 tab, 33
. WPRD 26 01.

scriptors: *Agricultural runoff, *Effluents,
n exchange, *Waste water treatment, Nitrogen,
me, Ammonia.
ntifiers: *Ammonia removal.

selective ion exchange process was developed
the removal of ammonia nitrogen from waste-
ters. The process employs a natural zeolite,
noptilolite, which is selective for ammonium
s in the presence of sodium, magnesium, and
cium ions. The ion exchange equilibria of four
olites was investigated and clinoptilolite was
ected for further study on the basis of its am-
nium ion selectively and low cost. A mobile
monstration plant having a capacity of 100,000
lons per day was designed and constructed to
nove ammonia from wastewater. The plant con-
ns facilities for flocculation, sedimentation,
wdered activated carbon adsorption, disinfec-
n, and mixed media filtration followed by ion
change and associated regeneration equipment.
erations of the mobile plant with secondary ef-
ent resulted in ammonia removals of 97 and 93
rcent at 70,000 and 100,000 gallons per day
pectively; thus demonstrating that selective ion
change provides a highly effective means for
noving ammonia from wastewater. (Cameron-
st Central Oklahoma State)
76-00452

IDELINES ON LIVESTOCK WASTE CON-OL FACILITIES.
braska State Dept. of Environmental Control,
ncoln.
esented at Livestock Waste Management
stem Design Conference for Consulting and
S Engineers, Lincoln, Nebraska, February 15-
1973, 12 p.

scriptors: *Livestock, *Farm wastes, Waste
atment, Waste disposal, Legal aspects,
ebraska, Permits, Pollution abatement,
reatment facilities.
ntifiers: *Waste control facilities.

e steps required for obtaining a permit for
estock operations where pollution potential ex-
s are given. Basically, the operator must first
uest a permit. The Department of Environmen-
tal Control then makes an inspection. If no controls are needed the permit is issued. If controls are needed, the Soil Conservation Service engineers design the controls and the operator places them into operation. Then the permit is issued. Samples of the forms to be filled out are included. (Marquard-East Central Oklahoma State)
W76-00453

RUNOFF CONTROL FOR A CREEK BANK FEEDLOT,
Agricultural Research Service, Lincoln, Nebr.
N. P. Swanson.
Presented at Livestock Waste Management System Design Conference for Consulting and SCS Engineers, Lincoln, Nebraska, February 15-16, 1973, 3 p. 1 fig.

Descriptors: *Livestock, *Farm wastes, Waste treatment, Waste disposal, Legal aspects, *Nebraska, Pollution abatement, Permits, *Treatment facilities.
Identifiers: *Waste control facilities.

Unless it is controlled, runoff from a feedlot on a flood plain or creek bank is a potential source of pollution. However, many times relocation of the feedlot by the owner is not feasible. One feedlot owner met this pollution problem by installing a ten foot high dike along the lower side of the feedlot next to the creek. The dike prevented runoff contamination of the water and flooding of the creek. It also provided comfort for the animals. Runoff from the feedlot was collected in a basin. Three riser inlets drained the basin into a sump. From there, the water was pumped to a holding pond from which it is spread as irrigation water to field crops. (Marquard-East Central Oklahoma State)
W76-00454

NEBRASKA ANIMAL WASTE RESEARCH,
Agricultural Research Service, Lincoln, Nebr.
T. M. McCalla.
In: Proceedings, Workshop on Livestock Waste Management, Ft. Collins, Colorado, Great Plains Agricultural Council Publication 56, p 18-28, 1972. 47 ref.

Descriptors: *Farm wastes, *Research and development, *Nebraska, *Feed lots, Runoff, Crop production, Costs, Management, Facilities, Odor, Terracing, Effluents, Water chemistry, Hydrology, Nitrates, Caissons, Waste disposal, Groundwater, Hydrology.
Identifiers: Loading rates.

Several different types of animal waste research are being studied. A discussion on each of the following is included in this paper: (1) land loading with manure, (2) costs for livestock waste management facilities, (3) feedlot runoff control and application of runoff on crops, (4) feedlot runoff control and feedlot waste management, (5) feedlot soil and water chemistry and groundwater hydrology, (6) runoff effluent disposal on cropland, and (7) odors. There is an explanation of each of these different studies; together with plans for continuing the research. (Cameron-East Central Oklahoma State)
W76-00455

THEORETICAL CONSIDERATIONS OF ANAEROBIC LAGOONS FOR POULTRY WASTES,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
E. P. Taiganides.
Second National Symposium on Poultry Industry Waste Management, University of Nebraska, Lincoln, May 19-20, 1964, 12 p. 1 fig.

Descriptors: *Lagoons, *Poultry, *Farm wastes, *Waste water treatment, *Waste disposal, *Anaerobic conditions, Odor, Design.
Identifiers: Flies, *Anaerobic lagoons.

Lagoons for the treatment and disposal of farm animal wastes are not the panacea they are reputed to be by the farm press. They have not been found suitable for the treatment of animal manures because of their high land surface and water requirements. The design criteria for the reduction of the solid matter of manure have not been established. Generally, lagoons will be judged by the following criteria: stabilization of the influent, control of odors, control of flies, and appearance. A properly functioning anaerobic lagoon should produce no vile odors. The main factors in anaerobic digestion are: temperature, loading rate, solids concentration, detention period, volatile acid concentration, solid matter accumulation and scum formation, essential nutrients concentration, toxic substances, and pH. Some of the design criteria for anaerobic lagoons discussed are: size, water depth, inlet, outlet, shape, and location. The most advantageous time to start a lagoon is during the summer. Seeding procedures are discussed. Mixing aids the manure degradation process. Flies will not breed in an anaerobic lagoon unless a scum forms. Good bacteria husbandry dictates the continuous feeding of the lagoon, except when it is frozen. The value of anaerobic lagoons will be better defined after the end of experiments now in progress. (East Central Oklahoma State)
W76-00456

AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL,
Agricultural Research Service, Lincoln, Nebr. Agricultural Engineering Research Div.
C. B. Gilbertson.
Report ARS 42-201, August 1972. 8 p. 2 tab, 6 ref.

Descriptors: *Feed lots, *Design, *Analysis, *Waste treatment, *Waste disposal, Farm wastes, Costs, Odor, *Oxidation lagoons, Water pollution, Design Agricultural runoff, Incineration, Pollution abatement.
Identifiers: *Pollution control, Mounding, Paved feedlots, Unpaved feedlots, Housed feedlots, Composting.

Feedlot waste management alternatives of paved, unpaved and housed feedlots are discussed. Alternatives which are listed are mounding, composting, incineration, oxidation ditches and mechanical scraping. The physical requirements for each system are given. The method to be used will vary considerably with the cattle density; however, these observations can be made: (1) odor problems will limit outdoor feedlots in the future, (2) high labor costs and discomfort to cattle will limit development of paved feedlots, (3) housed feedlots will increase in the future due to high labor cost and pollution problems of outdoor feedlots, (4) for a housed feedlot unit, the costs of structure is about 50% of the total materials costs, and (5) use of oxidation ditches with housed feedlots will increase materials' costs by 17 to 20%. (Marquard-East Central Oklahoma State)
W76-00457

THINK OF MANURE AS A RESOURCE, NOT A WASTE,
Agricultural Research Service, Lincoln, Nebraska.
T. M. McCalla.
Feedlot Management, Vol 14, No 5, 2 p, May, 1972. 1 fig, 3 tab.

Descriptors: *Farm wastes, *Water pollution, *Agricultural runoff, *Feed lots, Settling basins, Fertilizers, Mounding, Recycling, Odor, *Waste treatment, Solid wastes.
Identifiers: Broad-basin terraces, Land disposal.

Pollution of streams and lakes by feedlot runoff is a problem, but technology is available to combat it. If runoff is caught in broad-basin terraces or is allowed to settle out in settling basins, 50 percent or more of the solids will settle out. Reasons for catching these settleable solids are: (1) They con-

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tain most of the easily biodegradable material. (2) They reduce retention capacity, (3) If they get into a retention structure, they create anaerobic conditions resulting in foul odors. These solids may be used on the land for crop production or they may be put back on the feedlot for mounding. Mounding serves two purposes: (1) Mounds create an area that drains readily, generally is dry, and offers protection to the cattle from adverse weather conditions; and (2) they act as a compost heap for decomposition on the lot. Besides being used as a fertilizer, manure can also be recycled as oil, feed, building materials, and as food for yeast which may be fed to animals. (Merryman-East Central Oklahoma State)
W76-00459

NUISANCE LAWSUITS--NEIGHBOR VS. NEIGHBOR.
For primary bibliographic entry see Field 5G.
W76-00460

ANIMAL WASTE IN THE U. S. A.,
Massachusetts State Dept. of Agriculture, Worcester. Poultry Husbandry Adviser.
B. Hodgetts.
Agriculture, Vol 79, p 98-103, 1972. 3 fig.

Descriptors: *Farm wastes, *Waste water treatment, *United States, Aerobic treatment, Poultry, Lagoons, Degradation(Decomposition), Waste treatment.
Identifiers: *Land spreading, Anaerobic treatment, Duck wastes, 'Bressler' system, Composting, Dehydrated poultry wastes, Fly larvae.

This survey of American practice by an Englishman observes that 'land spreading is still, of course, generally the cheapest, most efficient and most popular means of disposing of animal manures, but the economic cost of doing this may in some cases be so high as to make the system unattractive.' Aerobic treatment of liquid wastes has advantages; its problems are foaming, sedimentation and high running costs. Aerobic treatment of solids by the 'Bressler system (Fan aeration in pits beneath cages) involves high capital costs. Composting is ineffective on poultry manure alone and, thus, involves blending with some other waste source. Anaerobic lagoons work admirable in the climate of Southern California with lagoon water being recirculated for flushing. Nutrient recycling and manure degrading with fly larvae are discussed. Fly larvae hold great promise in the 'the activities of the young larvae aerate and successfully deodorize the manure in 2-3 days and remove 50 percent of its moisture. The larvae are allowed to pupate and when dried and ground the pupae may be used as a protein source for the growing chick. The remaining manure may be further dried or pelleted and can be used as a soil conditioner or fertilizer, or even as a feed for catfish. The manure from 100,000 hens is expected to produce between 500 and 1000 lb of pupae meal daily.' (East Central Oklahoma State)
W76-00463

TREATMENT OF ANIMAL WASTES AT THE GREENFIELD LABORATORIES OF ELI LILLY AND COMPANY,
Lily (Eli) and Co., Greenfield, Ind. Greenfield Labs.
T. W. Bloodgood.
In: 21st Industiral Waste Conference Proceedings, Purdue University, Vol 50, No 2, p 56-61, March, 1966. 1 tab, 1 ref.

Descriptors: *Waste treatment, *Farm wastes, Livestock, Waste disposal, Lagoons, Aeration, Effluents, Sewage, Indiana.
Identifiers: *Greenfield Laboratories(Ind).

The waste treatment facilities at the Greenfield Laboratories handle the wastes generated by the thousands of animals used in the various production and research programs. There are five separate waste treatment plants that are located throughout the laboratories to serve the various research areas. Detailed description of wastes, treatment and disposal methods, and construction costs are given for each plant. The five plants are operated by two men from the Maintenance Department assigned to the Waste Treatment Operations. Total operating costs for all plants, not including utility costs, are approximately $55,000 a year. (Cartmell-East Central Oklahoma State)
W76-00464

COORDINATED LIVESTOCK PRODUCTION SYSTEMS,
Department of Agriculture, Lincoln, Nebr.
N. C. Teter, and B. C. Gilbertson.
Presented at Livestock Waste Management System Design Conference for Consulting and SCS Engineers, Lincoln, Nebraska, February 15-16, 1973, 10 p. 4 tab.

Descriptors: *Waste treatment, *Livestock, *Farm wastes, Cattle, Hogs, Waste disposal, Design criteria, Feeds, Waste storage, Lagoons, Odor, Irrigation systems, Performance.
Identifiers: *Coordinated production systems, Water systems, Electrical power systems.

The components necessary for designing a complete livestock production unit are discussed. Specific publications are recommended which will aid in designing water systems and electrical power systems. Ideas are given for swing and beef handling systems. Feeding systems, and waste management systems. All variables should be coordinated in order to create a total system that is easy to manage. Even the best designed system will fail if it is not properly managed. (Marquard-East Central Oklahoma State)
W76-00465

FEEDLOT ODOR,
M. D. Paine.
In: Great Plains Beef Cattle Feeding Handbook, Cooperative Extension Service--Great Plains States, GPE-7800, L-1101, November, 1972, p 7800.1-7800.2.

Descriptors: *Feed lots, *Odor, *Aerobic conditions, *Anaerobic conditions, *Waste treatment, *Ammonia, Biological oxygen demand, Nutrients, Metabolism, Nitrogen, Aeration, Waste disposal.

Feedlot odor is caused by the anaerobic metabolism of nutrients found in cattle manure. However, when the nutrients are metabolized aerobically the end products are heat, CO_2, and water. For aerobic metabolism to occur, the oxygen transfer rate must exceed the biological oxygen demand. When the demand is greater than the transfer rate, anaerobic metabolism produces odor compounds. Ammonia is also produced in feedlots. It is lighter than air and has an irritating smell. It escapes as a gas from urine, but will be absorbed by moist manure. The transfer of nitrogen is ammonia and amines not only produces irritating smells, but may enrich ponds, hastening eutrophication. Odor occurs in three places--the dry surface, solid manure beneath the surface, and holding ponds. Aerobic metabolism depends on temperature, oxygen, and water; the last two may possibly be controlled. Moisture can be partially controlled by good drainage, cattle density and water. Since 40% moisture content is required for best aerobic activity, sprinkling may be required in dry seasons. Odor from ponds may be controlled by diluting nutrients, adding more water, or using aeration equipment. Manure may be stockpiled into compost heaps prior to being dispersed on farm land. (Lee-East Central Oklahoma State)
W76-00467

HANDLING MILKING-PARLOR WASTE,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
R. G. Bell, and J. B. Robinson.
Canadian Agricultural Engineering, Vol 14, No p 56-58, December, 1972. 2 fig, 1 tab, 8 ref

Descriptors: *Dairy industry, *Farm wastes, C tle, *Waste treatment, Waste storage, Wa disposal, *Aeration, *Canada Chemical analys Odor, Chemical oxygen demand Septic tanl Lagoons, Irrigation, Nitrogen, Hydrogen ion c centration.
Identifiers: Milking-parlor wastes.

An assessment was made of the treatability o typical milking-parlor effluent by aeration to h determine the most feasible disposal method the watery waste. Four day's aeration of milk parlor waste produced a clarified effluent wit BOD of 200 parts per million. This effluent v not of a sufficiently high standard for dir discharge into a water course. It was conclu that aeration, followed by surface wa discharge, and septic tank disposal are unacce ble practices for disposal of milking-parlor wa in Ontario. Storage in an aerobic lagoon combi with spray or furrow irrigation is a feasible alter tive but is hampered by the winter conditi prevailing in the province. Where the manure is ready being handled as a liquid, the most satisf tory alternative would appear to be combining milking-parlor waste with the manure where liq storage is available. (Cartmell-East Cen Oklahoma State)
W76-00469

ODOR PROBLEMS ASSOCIATED WI AGRICULTURAL WASTE HANDLING,
Michigan Dept. of Natural Resources, Lans Air Pollution Control Div.
P. R. Shutt.
Presented at Agricultural Waste Confere Emphasis-Animal Waste, Kellogg Cen Michigan State University, East Lansing, May 23, 1974, p 25-29.

Descriptors: *Odor, *Michigan, *Air pollut *Regulation, *Permits, Poultry, Cattle, Dairy dustry, Hogs.
Identifiers: *Waste handling.

The Air Pollution Control Commission is respo ble for controlling air pollution in the state Michigan. The Michigan Air Pollution Con rules require that a permit be obtained from Commission prior to installation of facilities wh could result in air pollution or prior to the insta tion of facilities meant to control air pollut This is interpreted to include agricultural facil as well as other industries. Michigan's n agricultural odor sources, poultry, swine, beef dairy operations have several factors in comm large concentrations of livestock in confi areas, problems with good housekeeping, an liquid waste handling systems. Thus isolat good housekeeping methods, and good w disposal methods and techniques are desira Specific procedures and recommendations made for each of these four types of lives operations. (Merryman-East Central Oklah State)
W76-00472

SUMMARY OF SYMPOSIUM ON CONV SION OF POULTRY WASTE.
November 10, 1971, 60 p.

Descriptors: *Farm wastes, *Poultry, *W disposal, *Waste treatment, Dehydra Recycling.
Identifiers: *Conversion.

These papers were concerned with poultry ma waste management and disposal. The benefi drying poultry manure and the potential of po manure recycling were explored. It was d mined that a great deal of research and field te is needed to fully develop the process of po

waste conversion so that new products can be used, marketed or safely discharged into our environment. (See W76-00477 thru W76-00482) (Merryman-East Central Oklahoma State)
W76-00476

24 MILLION POUNDS OF OPPORTUNITY,
Cloisterdale Farms, Ephrata.
G. Herr.
In: Summary of Symposium on Conversion of Poultry Waste, Lancaster Farm and Home Center, Lancaster, Pennsylvania, November 10, 1971, 14 p. 1 fig.

Descriptors: *Farm wastes, *Waste disposal, *Recycling, *Waste treatment, Poultry, Cattle, Hogs, Lagoons, Odor, Fertilizer, Irrigation, Dehydration, Incineration, Costs.
Identifiers: *Shud, *Agri-business, Composting, Land spreading, Semi-dry waste, Refeeding, Community Relations.

Agri-waste not only is a problem to our environment, it also is a huge untapped resource. Many problems stand in the way of utilization of this resource, but if everyone works together, pollution caused by waste can be lessened and waste can be used beneficially. Experiments at Cloisterdale Farms have indicated that even large operations can handle their waste by gradually converting waste to semi-dry; thus reducing waste moisture to 28-35%. Odor free semi-dry waste can then be hauled off and spread on land. Also, possible dehydration might lend to fertilizer products, re-feeding, composting or other uses of waste. Conclusions indicate that liquid handling; be it lagoon, irrigation or hauling would not be the long range answer to disposal problems. Getting rid of the waste is not just a problem; getting rid of it profitably is an opportunity. (See also W76-00476) (East Central Oklahoma State)
W76-00477

MANURE REDUCTION AND CONVERSION METHODS OF THE FUTURE,
Pennsylvania State Univ., University Park. Dept. of Poultry Science.
G. O. Bressler.
In: Summary of Symposium on Conversion of Poultry Waste, Lancaster Farm and Home Center, Lancaster, Pennsylvania, November 10, 1971, 4 p.

Descriptors: *Farm wastes, *Dehydration, *Waste treatment, *Poultry, Drying, Environment, Anaerobic bacteria, Odor.
Identifiers: Drying pits.

Pennsylvania State researchers have been investigating dehydration of manure as an economic solution to waste problems and have developed a two-stage drying system. In stage one, the use of high velocity air movement and mechanical stirring of the manure in the pit reduces each 2.9 tons of manure to 1 ton, a reduction of about 3 to 1. The resulting manure can be easily transported with a minimum of odors. Stage two dries the remaining manure in a dryer to a moisture level of about ten percent. The result is a fine, dry manure product, free from offensive odors and able to be stored without deterioration or odor formation. Dehydration offers the best hope for the future. Not only does this method have the advantage of reducing the quantity of material and offensive odors, its influence on improvement of the poultry house environment may show additional benefits. Working conditions for the caretaker would also be improved. These advantages may very well off-set some of the costs of handling manure by the dehydration method. (See also W76-00476) (Russell-East Central Oklahoma State)
W76-00478

ECONOMICS OF MANURE HANDLING,
Pennsylvania State Univ., University Park. Dept. of Agricultural Economics.
A. P. Stemberger.
In: Summary of Symposium on Conversion of Poultry Waste, Lancaster Farm and Home Center, Lancaster, Pennsylvania, November 10, 1971, 1 p.

Descriptors: *Farm wastes, *Poultry, *Waste disposal, Cost analysis, Economics, Waste treatment.
Identifiers: *Waste management, Conversion.

Data was collected by personal interview of managers of egg production enterprises and by observation of operations whenever possible. Information was collected regarding type of waste disposal systems used, investment necessary, operating costs, labor required, odor and insect problems, method and frequency of manure removal and disposal, size of operation and performance of layers. This information is being analyzed to determine costs of handling and removing manure from egg laying houses by various methods. An investigation of costs of methods of processing raw manure into saleable products, size of market, and estimation of demand for poultry manure products is being conducted. The objective is to determine manure handling costs for various systems. Naturally, the industry is interested in methods with the least cost. But, they also realize that the least-cost system of handling manure may not always be the best one. They are striving to find a system that does not affect layer performance and produces a desired saleable end product. After careful study of specific operations, results will have to be used with caution. (See also W76-00476) (Russell-East Central Oklahoma State)
W76-00479

MODIFY YOUR POULTRY HOUSE FOR MANURE DRYING,
Pennsylvania State Univ., University Park. Poultry Science.
F. W. Hicks.
In: Summary of Symposium on Conversion of Poultry Waste, Lancaster Farm and Home Center, Lancaster, Pennsylvania, November 10, 1971, 6 p.

Descriptors: *Farm wastes, Poultry, *Drying, Dehydration, *Waste treatment, Waste disposal, Odor, Ventilation, Air conditioning, Environmental control, Lagoons, Aerobic bacteria, Anaerobic bacteria.
Identifiers: *Poultry house, In-house drying.

A lot of material is being written about efficient and practical waste handling, but no one has devised the system which could be considered the final answer to poultry housing and waste management. It seems that drying or dehydration is the best answer, and one easily utilized drying method is from the ventilation system within the poultry house. The partially dried waste could then be spread on land, allowed to be broken down by bacteria, or stored. In-house drying also reduces odors significantly, and usually very little house modification is necessary. No matter what type of waste handling system is used, it must be: (1) Socially acceptable to neighbors, (2) Economically feasible and practical, (3) Mechanically possible and simple, (4) Legal according to local and federal regulation. If at all possible, waste should be disposed of in such a way that it may be recycled to avoid a drain on natural resources. (See also W76-00476) (Russell-East Central Oklahoma State)
W76-00480

THE ECONOMICS OF RECYCLING CONVERTED POULTRY WASTE THROUGH CATTLE,
Pennsylvania State Univ., University Park. Dept. of Animal Science.
T. A. Long.
In: Summary of Symposium on Conversion of Poultry Waste, Lancaster Farm and Home Center, Lancaster, Pennsylvania, November 10, 1971, 6 p, 2 tab.

Descriptors: *Farm wastes, *Poultry, *Recycling, *Waste disposal, Litter, Organic matter, Proteins, Costs, Waste treatment.
Identifiers: *Wastelage, *Refeeding, Ensilage.

Experiments have shown that poultry manure and litter fed to cattle as part of a balanced ration can give satisfactory results. Poultry waste is especially good as a protein supplement for ruminants, because rumen microorganisms are able to utilize the nitrogenous compounds of the manure and synthesize bacterial protein which can then be utilized by the host animal. Many factors favor use of poultry waste as feed. It would be an economic and efficient use of a huge resource and would remove the large problem of waste management. Experiments were conducted on Hereford steers to evaluate nutritional and economic feasibility of using fresh poultry excreta as a major component of wastelage. Three growing rations calculated to support 1.65 pounds of body weight gain per day were devised and cost per hundred pounds of gain calculated. When results were tabulated, it was found that while all rations gave economical gains, it would have cost about 45% less per hundred pounds gain when the cattle were fed corn wastelage as compared to alfalfa hay. (See also W76-00476) (Russell-East Central Oklahoma State)
W76-00481

SOME POTENTIAL USES FOR DEHYDRATED POULTRY WASTES,
Pennsylvania State Univ., University Park. Dept. of Poultry Science.
O. D. Keene.
In: Summary of Symposium on Conversion of Poultry Waste, Lancaster Farm and Home Center, Lancaster, Pennsylvania, November 10, 1971, 11 p, 4 tab, 15 ref.

Descriptors: *Farm wastes, *Poultry, *Dehydration, *Recyling, *Waste treatment, *Waste disposal, Nutrition, Nitrogen, Proteins, Ruminants, Bacteria, Insects.
Identifiers: *Refeeding, Uric acid, Environmental protection.

Disposing of poultry waste is a problem which is increasing in magnitude. Recycling as feed offers promising results to researchers. Inclusion of poultry manure into diets of ruminants has been reported by many investigators, and ruminants apparently can use many of the ingredients found in poultry wastes. However, incorporation of manure into the diets of poultry has had limited success. The major basis for this is uric acid. Uric acid apparently is detrimental to poultry by acting as an irritant in the intestinal tract. Due to experiments, it seems apparent that refeeding poultry manure back into poultry has very limited possibilities. Research into other areas of disposal is also being conducted. Insect disposal of waste is one possibility, but much study needs to be done before we engage in large scale use of insects. Also bacterial fertmentation is a possible avenue for disposal. No matter what the method there will be problems, but perhaps a feasible working solution will result from further research and study. (See also W76-00476) (Russel-East Central Oklahoma State)
W76-00482

APPLICATIONS TO PLATING WASTEWATER TREATMENT OF SLOPED PLATES SETTLING TANK (KEISHA-BAN SHIKI CHINDEN SO NO MEKKI HAISUI SHORTI E NO OYO).
Sangyo Kogai, Vol 11, No 7, p 660-669, July, 1975. 25 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Coagulation, Mixing, *Chemical precipitation, Oxidation, Neutralization, Suspended solids, Chromium, Monitoring.
Identifiers: Metal plating wastes, Japan, Cyanide.

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The joint research of the Industrial Pollution Control Association of Japan and Yasukawa Electric Manufacturing Company on water treatment techniques for metal plating waste water is presented. A new precipitation bath and a unique coagulation-mixing bath and the operational results obtained from experimental studies were discussed. The metal plating waste water was treated by ordinary techniques in oxidation and neutralization reactions. However, both the coagulation-mixing bath and precipitation bath exhibited unique features. The former bath utilized a vertical motion mixing technique to strengthen the coagulating effect, and the latter bath was equipped with sloped plates which reduced the necessary size of the precipitation bath. The capacity of each bath was 30 cu m/hr waste water. The precipitation bath contained 89 vinylchloride plates (100 x 200 x 2 mm) placed 50 mm apart at a 60 degree angle with respect to the surface of the water. Ferric chloride and a high polymer coagulant were added to the coagulation-mixing bath at concentrations of 50 ppm and one ppm, respectively. A sludge concentration of 1.3 percent was obtained after a 20 min precipitation time. The quality of the treated water was better than 1/2 of the water quality standard. The suspended solids concentration was 5 ppm, no cyanide ions could be detected up to a 0.01 ppm limit, and the amount to monitor the treatment facility. Periodical removal of sludge from the precipitation bath was performed using an ultrasonic sensor. The maintenance of the sloped plates was not complicated. The particle adhesion onto the plates did not grow deeper than 2 mm, and cleaning only once or twice a month was sufficient. (Katayama-FIRL)
W76-00492

ACTIVATED CARBON TREATMENT OF PAPER AND PULP EFFLUENTS, (KAMI PARUPU HAISUI NO KASSEITAN SHORI),
T. Shogenji.
Yosui to Haisui, Vol 17, No 8, p 1016-1022, August, 1975. 13 fig, 6 tab, 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Activated carbon, Lignins, Adsorption, Chemical oxygen demand, Pre-treatment, Water reuse, Dyes, Surfactants, Alkyl benzene sulfonates, *Pulp wastes.
Identifiers: Activated carbon regneration.

The activated carbon treatment of pulp and paper waste water is summarized. Pulp waste water contains high molecular weight compounds such as lignin, and behaves differently from ordinary waste water when treated with activated carbon. The adsorption rate of lignin to the activated carbon is slower than that of ABS and dyes. The saturation of activated carbon occurs with lower levels of COD in pulp waste water than in sewage water. For a pre-treated pulp waste water containing 59 ppm COD, 100 mg COD were reported to saturate one g activated carbon; the amount of COD saturation on the carbon increased with decreased pH of the waste water from 10.6 to 7.6. It is a costly operation to use activated carbon to lower the COD value of pulp waste water to 10 to 20 ppm. Therefore, pre-treatment of raw waste water prior to activated carbon treatment is necessary. Pretreatment can be by physical, chemical, and/or biological methods. Combinations of methods are very economical as well as effective in purifying the pulp waste water for reuse. Activated carbon can be regenerated by heating. The regenerated activated carbon increases its adsorptivity for kraft lignin, this is attributed to the increased micropore sizes in the regenerated carbon caused by heating. The construction cost of treatment plants for pulp waste water and the required amount of activated carbon increase as higher BOD removal efficiency is demanded. (Katamya-FIRL)
W76-00493

INDUSTRIAL EFFLUENTS CLEANING AUTOMATIC REGULATION.
Soviet Patent SU 453360. Issued January 1, 1975.
Soviet Inventions Illustrated, Vol W, No 25, p D6, July 29, 1975, 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Flotation, Electrodes, Suspended solids, Electric currents, Oil industry, Textiles, Metals, Food processing industry, Automatic control.
Identifiers: *Electro-flotation.

An automatically controlled electroflotation cleaning process has been patented which is suitable for treating effluents from the oil, metallurgical, meat, and textile industries. It involves passing current between electrodes in a flotation tank. In order to improve the cleaning effectiveness and provide savings in power, the current density to the electrodes is varied in proportion to the degree of suspended solids concentration allowable in the treated effluent. The flotation installation contains an electrode system and an effluent components sensor connnected to a regulator and rectifier. The suspended solids concentration in the untreated effluent affects the current density between the electrodes. By varying the current density, any degree of purification may be obtained. (Orr-FIRL)
W76-00494

INDUSTRIAL REFUSE INCINERATION IN THE ROTARY KILN (INDUSTRIEMUELL VERBRENNUNG IM DREHROHROFEN).
For primary bibliographic entry see Field 5E.
W76-00495

CLOSED CIRCUIT PAPER MILL EFFLUENT TREATMENT.
French Patent FR 2246-690, Issued June 6, 1975.
French Patents Abstracts, Vol W, No 28, p F6, August 19, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Water reuse, *Recycling, Closed conduits, Water circulation, *Pulp wastes.
Identifiers: *Zero discharge.

A patent has been issued for a closed circuit paper mill effluent treatment process. The total effluent containing fibers and chemicals produced from paper manufacturing is collected in separate closed circuits. Part of the untreated effluent is used for pulp heating and dilution. The remainder is collected in at least one other closed circuit, regenerated by the addition of chemicals, conditioned, and then supplied to the papermaking process in place of fresh water. The advantages of the system include: a smaller consumption of fresh water; almost complete elimination of waste water and sludge disposal; no harmful effect on sludge dewaterability; no build-up of salts; and, the use of a smaller quantity of expensive chemicals. Complete utilization of the feed material is effected with improved pulp dispersion and dewatering capacity due to the higher temperatures. (Orr-FIRL)
W76-00496

TEXTILE DYE EFFLUENT TREATMENT.
French Patent FR 2246-501. Issued June 6, 1975.
Frech Patents Abstracts, Vol W, No 28, p F2, August 19, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Dyes, *Textiles, Activated carbon, Biological treatment, Chemical oxygen demand, Water reuse.

A treatment system for textile dyeing waste waters has been patented. The effluents from textile dyeing are purified in a two-stage treatment process consisting of biological treatment followed by adsorption. In the first stage, the COD of the influent is reduced to 350-450 mg/liter. The effluent from the first stage is then passed through an activated carbon filter. The process produces an effluent with a very low final COD level without the addition of flocculants. It is well suited for the reuse of water for industrial purposes. (Orr-FIRL)
W76-00497

USED OILS AS SOURCES OF RAW MATERIALS AND OF ENERGY (LES HUILES USAGEES SOURCE DE MATIERES PREMIERES ET D'ENERGIE),
R. Audibert, and P. Trambouze.
Informations Chimie, No 145, p 119-120, 123-127, June, 1975. 12 fig, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Oil wastes, Fuels, Suspended solids, Flocculation, Filtration, Incineration, Energy.
Identifiers: Used motor oil.

The problems and possibilities of the utilization of used oil, especially of used motor oil, as an energy source and in the production of new oil are discussed. In view of the serious pollution hazard involved in disposing of used oils, their utilization is justified in all cases. Used motor oil can be burned together with standard fuel oil in conventional burners when added in relatively small quantities, but requires special equipment for ash and lead separation when burned along. When the used motor oil is going to be used in the production of new oil, mechanical impurities must be removed by filtration, after which water and lightweight hydrocarbons must be eliminated. Suspended solids may be separated by flocculation using solvents or sulfuric acid or by thermal methods. Treatment with sulfuric acid or hydrogenation is necessary for the separation of soluble oxidized compounds before vacuum distillation. The energy expenditure required for recovery of used oil is lower than that required for the initial production. (Takacs-FIRL)
W76-00498

WATER BUDGET OF A REFINERY (WASSERHAUSWIT EINER RAFFINERIE),
M. Siebert.
Umwelthygiene, Vol 1, No 7, p 189-191, July 1975. 5 fig, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Water utilization, *Water reuse, Water circulation, Water treatment, Phenols, Emulsions, Recycling, Hydrology, budget.
Identifiers: *Refineries, Closed water cycles, Oil/water separation.

The water budget and complete water cycle of the Mobil Oil Refinery at Woerth, West Germany, are described. Well-water to be used in the refinery is treated with lime and chlorine-oxidized ferrous sulfate for decarbonization and the removal of organic components. Boiler feed-water is prepared by means of gravel filters, ion exchange and combinations of these. The ion exchange resins are regenerated with hydrochloric acid and sodium hydroxide which are subsequently neutralized. The pH of the cooling water, containing a corrosion inhibitor, is adjusted to a 7.5 by means of sulfuric acid. The phenols in the liquor used for gasoline washing are separated by pH adjustment. These phenols are currently incinerated, but the reuse for useful purposes is envisaged. The hydrogen sulfide and mercaptans in process waters are separated in an acid water stripper. The waste water thus purified is reused for the desalting of crude oil. While oil-free waste waters, such as storms water, are treated mechanically, oily waste waters are treated in a mechanical oil separator, after which the emulsion is broken in an aerated flotator. (Takacs-FIRL)
W76-00499

5E. Ultimate Disposal Of Wastes

ON THE COMPOSTING OF WASTES FROM THE PULP AND PAPER INDUSTRY (UEBER DIE VERKOMPOSTIERUNG VON ABFAELLEN DER ZELLSTOFF UND PAPIERINDUSTRIE),
F. Opderbeck.
Das Papier, Vol 29, No 7, p 308-312, July, 1975. 5 fig, 3 ref, 2 tab.

Descriptors: *Bark, *Sludge, *Pulp and paper industry, *Waste treatment, Nutrients, Mixing, Wastes, Industrial wastes, Water pollution sources, Sludge treatment, Sludge disposal, Waste disposal, Economics, Marketing, Water pollution control, Solid wastes.
Identifiers: *Composting.

The waste-processing study group of the Verein Zellcheming's technical committee for environmental problems has dealt with the possibilities of composting pulp and paper industry wastes. These investigations are reported. Following a short description of the chemical composition of sludge and bark, as well as the anatomical structure of the latter, the preparation of bark for composting and mixing with sludges and any required nutrient salts are dealt with. The conducting of composting experiments as well as the most important processes and resulting grades and qualities of compost are described. Problems of eocnomics and marketing are also covered. (Speckhard-IPC)
W76-00038

EFFECT OF BARK ADDITION UPON THE DEWATERING PROPERTIES OF BIOLOGICAL SLUDGES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, Mich. Central-Lake States Regional Center.
For primary bibliographic entry see Field 5D.
W76-00043

COMPARATIVE STUDY OF THERMAL TECHNIQUES FOR SECONDARY SLUDGE CONDITIONING,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, Mich. Central-Lake States Regional Center.
For primary bibliographic entry see Field 5D.
W76-00046

STRESS DETERMINATION BY HYDRAULIC FRACTURING IN SUBSURFACE WASTE INJECTION,
Geological Survey, Reston, Va.
R. G. Wolff, J. D. Bredehoeft, W. S. Keys, and E. Shuter.
American Water Works Association Journal, Vol 67, No 9, p 519-523, September 1975. 9 fig, 12 ref.

Descriptors: *Waste water disposal, *Injection wells, *Fractures(Geologic), *Hydrostatic pressure, *Colorado, Stress, Tensile strength, Aquifers, Stress analysis, Methodology, Geology, Earthquakes, Geomorphology, Hydrogeology, Water pollution control.
Identifiers: *Hydraulic fracturing, *Piceance basin(Colo).

By the utilization of commercially available and specially designed equipment, hydraulic fracturing experiments were conducted on a regional scale in the Piceance Basin of northwest Colorado. These tests confirmed that vertical fractures may be hydraulically induced at well-face injection pressure of about two thirds of the total overburden load. Further, the fractures will continue to propagate vertically as long as injection pressure exceeds the combined value of least principal horizontal stress and tensile strength which may lead to contamination of potable water aquifer and may trigger earthquakes. (Woodard-USGS)
W76-00089

SLUDGE DEHYDRATION IN WASTEWATER TREATMENT PLANTS OF THE PULP AND PAPER INDUSTRY WITH SPECIAL REGARD TO THE DOUBLE FILTER PRESS (SCHLAMMENTWAESSERUNG IN ABWASSERREINIGUNGSANLAGEN DER ZELLSTOFF- UND PAPIERINDUSTRIE UNTER BESONDERER BERUECKSICHTIGUNG DER DOPPELSIEBPRESSE),
For primary bibliographic entry see Field 5D.
W76-00129

WASTE WATER DISPOSAL OF PAINTING FACTORY AND CLOSED-SYSTEMATIZATION (TOSO KOJO NO HAISUI SHORI TO KUROZUDO-SHISUTEMU KA),
For primary bibliographic entry see Field 5D.
W76-00133

PRESENT SITUATION OF WASTE WATER FROM PRINTING AND FILM DEVELOPING PLANTS AND TREATMENT (INSATSU SHASHIN GENZO KOJO HAISUI NO JITTAI CHOSA TO SHORI NI TSUITE),
For primary bibliographic entry see Field 5D.
W76-00134

TREATMENT OF MUNICIPAL WASTEWATER BY LAND APPLICATION,
Metcalf and Eddy, Inc., Palo Alto, Calif.
C. E. Pound, and R. W. Crites.
Water and Sewage Works, Reference Number, R45, R48, R50, R53-54, R56, April 30, 1975. 1 fig, 7 tab, 23 ref.

Descriptors: *Waste water disposal, *Waste water treatment, *Reviews, Soils, Irrigation, Overland flow, Infiltration, Groundwater, Costs, Legislation, Surveys, Water pollution control, Water reuse.
Identifiers: *Land application.

A review is presented on the treatment of sewage effluents by land application. Research sponsored by various government agencies is being performed to gain a greater understanding of the ability of soil to treat waste water by physical, chemical, and biological means. Proper management and monitoring are required for successful land treatment systems. Land treatment can compete in many locations with advanced waste water treatment. Land treatment can be used in water pollution control systems in place of, in addition to, or in conjunction with conventional treatment methods. Topics covered in the review include: surveys; legislation; irrigation; overland flow; infiltration-percolation; waste water quality; and, cost of land treatment. Land treatment and recycling are encouraged by PL 92-500. Irrigation, the most commonly used land application method, is the application of water to the land to meet the growth needs of plants either by surface or spray application. Overland flow is a modification of spray irrigation to impermeable or poorly drained solids. In overland flow, a substancial portion of the waste water applied is designed to run off and must be collected and discharged to receiving waters or reused. Infiltration-percolation systems are characterized by percolation of the majority of the waste water through the soil to the groundwater and is restricted to rapidly permeable soils. Costs of land treatment systems will include the land, earthworks, pumping and transmission facilities, distribution systems, monitoring facilities, and for some systems, collection and storage facilities. (Orr-FIRL)
W76-00203

A NEW LOOK AT SEWERAGE AND SEWAGE DISPOSAL.
For primary bibliographic entry see Field 5D.
W76-00213

AUTOGENUS INCINERATION OF SEWAGE SLUDGE NOW POSSIBLE,
Komline-Sanderson, Ltd. Brampton, (Ontario).
For primary bibliographic entry see Field 5D.
W76-00219

EVAPOTRANSPIRATION POSSIBLE NEW SEWAGE TREATMENT PROCESS.
For primary bibliographic entry see Field 5D.
W76-00221

IRRADIATION OF SEWAGE GAINS ADHERENTS,
For primary bibliographic entry see Field 5D.
W76-00230

PILOT-SCALE, HIGH-RATE BIOLOGICAL DENITRIFICATION,
Ecolotrol, Inc., Bethpage, N.Y.
For primary bibliographic entry see Field 5D.
W76-00238

TREATMENT OF SLUDGE FROM SEWERAGE AND BURNT ASHES,
Environmental Protection Agency, Research Triangle Park, N.C.
F. Yanagi.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 731-T, $3.25 in paper copy, $2.25 in microfiche. Japan Patent Agency, EPA-TR-24 73, August 15, 1966. 7 p, 1 fig.

Descriptors: *Patents, *Sludge treatment, *Dehydration, *Incineration, Precipitation(Chemical), Sewerage, Waste disposal, Sludge disposal, *Waste treatment.

An application for a patent to treat sludge from sewerage and burnt ashes has been filed. The method of treatment of ash and exhaust gas from the burning of dehydrated sludge solids is detailed. The burned ash will be divided into a portion containing iron compounds and one containing calcium, and these will be collected for reuse as precipitates. The steps of filter dehydration and burning of the sludge are combined into one process in this invention. A diagram of the procedures is provided for graphic illustration. (Kramer-FIRL)
W76-00244

INTERIM REPORT ON TASK FORCE ON PHOSPHATE REMOVAL SLUDGES,
Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-00248

SEWAGE TREATMENT AND DISCHARGE INTO TROPICAL COASTAL WATERS,
University of the South Pacific, Suva (Fiji). School of Natural Resources.
D. B. Nedwell.
Search, Vol 5, No 5, p 187-190, May, 1974. 2 fig, 25 ref.

Descriptors: *Eutrophication, *Effluents, Sewage disposal, Algae, Sewage treatment, Waste water treatment, Tertiary treatment.
Identifiers: *Tropical coastal waters, *Mangroves.

Sewage discharged into coastal seawater in tropical areas is most often discharged into barrier-reef lagoons rather than into the open sea. Because very little mixing takes place and because tropical seawater is naturally nutrient-deficient, the eutrophication that occurs seriously disrupts the ecological balance. While several alternatives have been implemented--primary and secondary treatment of raw sewage, further treatment to remove soluble inorganic phosphorus and nitrogen,

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package treatment for sewage from recreational 'tourist' areasn-a new suggestion has been proposed. This is the concept of discharging treated sewage effluents, particularly the nitrogenous portion, into a mangrove-bounded estuary. A mangrove environment is naturally rich in organic material so that increased organics are not as disruptive as in the organically poor lagoon and reef. The mangrove area, which is common to many tropical regions, may act as a tertiary treatment site and discharge point. Simple retaining ponds in mangrove areas may then result in an effluent with large fractions of inorganic nutrients removed. Costs of building outfall pipes to sea may also be eliminated. (Kramer-FIRL)
W76-00259

COMPUTER MODEL GUIDES SALT WATER WELL CONSTRUCTION,
EBA Engineering Consultants Ltd. Edmonton (Alberta).
For primary bibliographic entry see Field 5A.
W76-00285

SURVEY OF GROUND-WATER PROTECTION METHODS FOR ILLINOIS LANDFILLS,
Illinois Environmental Protection Agency, Springfield, Div. State of Land Pollution Control.
For primary bibliographic entry see Field 5B.
W76-00293

PLASTIC OUTFALL LAID EXTRA DEEP.
Water and Pollution Control, Vol 113, No 7, p 19, 25, July, 1975.

Descriptors: *Plastic pipes, *Outfall sewers, *Canada, Waste disposal, Construction materials, Pipelines, *Computer programs, Inspection, Installation, Waste water treatment.
Identifiers: Marine disposal, Stress evaluation for submergence in marine environments (SESME).

A 1670-foot, 24-inch diameter municipal outfall of polyethylene pipe was installed to replace a deteriorated line at Powell River, British Columbia. Because the line discharges its wastes 200 feet below the surface, stresses that would be imposed on the large-diameter pipe had to be evaluated before construction. This was accomplished with a computer program called Stress Evaluation for Submergence in Marine Environments (SESME). It was found that excessive bending stresses could be eliminated by attaching cedar logs to the floating pipe; the logs were later salvaged once the pipe had been located on the ocean bottom. A polyethylene material was chosen for the outfall line in order to achieve maximum flexibility, particularly where the route followed the curvature of the terrain. Specifications for the line included: tolerances for minimum radius of curvature for the 15-degree bend in the line; maximum departure from design alignments; and requirements for ballast weights to provide negative buoyancy for the pipeline. The line was joined on shore, and then was laid on the sea bottom using a 'controlled sink' method, whereby water was allowed to enter the shore end of the pipe while displaced air was expelled from the other end. The pipe formed an S-type curve off the bottom to the surface, and held its shape as it sank toward the outboard end. When the outfall was in place on the ocean bottom, a mini-submarine was used for final inspection of the installation. (Kramer-FIRL)
W76-00343

WASTE WATER PURIFICATION USING ACTIVE CARBON AND ASH.
For primary bibliographic entry see Field 5D.
W76-00346

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,
Massachusetts Inst. of Tech. Cambridge, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-00355

POSSIBILITIES OF WASTE WATER IRRIGATION IN FORESTS (MOEGLIHCKEITEN DER ABWASSERVERREISELUNG IN WALD-BESTAENDEN),
Goettingen Univ. (West Germany).Inst. of Soil Science and Forest Nutrition.
For primary bibliographic entry see Field 5D.
W76-00366

ANIMAL WASTE MANAGEMENT IN TEXAS: TESTIMONY PRESENTED TO THE SOLID WASTE STUDY COMMITTEE OF THE TEXAS HOUSE OF REPRESENTATIVES,
Texas Agricultural Extension Service, College Station.
For primary bibliographic entry see Field 5G.
W76-00426

CONSEQUENCES OF WASTE DISPOSAL ON LAND,
Agricultural Research Service, St. Paul, Minn. Soil and Water Conservation Research Div.
W. E. Larson, J. R. Gilley, and D. R. Linden.
Journal of Soil and Water Conservation, Vol 30, No 2, p 68-71, March-April, 1975. 1 fig, 4 tab, 22 ref.

Descriptors: *Waste disposal, *Organic wastes, *Sewage sludge, *Sewage effluents, Reclamation, Productivity, Crop response, Wind erosion, Pollution abatement.
Identifiers: *Land disposal.

Organic wastes can be used safely and effectively to increase soil productivity if proper precautions are taken concerning heavy metals, toxic chemicals, nitrate leaching, erosion losses, and undesirable odors. Average composition is given for animal wastes (dairy cattle, beef cattle, swine and poultry hens), sewage sludge and secondary sewage effluent. Farm manures contain the major nutrients in the most correct proportion for soil fertilization. They also decrease bulk density, increase aggregate stability, increase water intake rates, and help control soil erosion. Sewage sludges are effective in reclaiming such productive land as mine spoil banks, wastes from a soda glass factory, dune and dredged sands, and abandoned garbage dumps and sanitary land fills. There is also evidence that crop yield increases as the result of irrigation with treated municipal wastewater. Proper waste management measures must be taken to protect the environment. When applied at crop use rates and with proper soil management, most organic wastes present no serious environmental hazards and should be considered a resource that agriculture can very well use. (Merryman-East Central Oklahoma State)
W76-00427

NUTRIENT TRANSFORMATIONS IN A SWINE WASTE OXIDATION DITCH,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W76-00429

TREAT YOUR WASTE RIGHT,
For primary bibliographic entry see Field 5D.
W76-00432

TAKING CARE OF WASTES FROM THE TROUT FARM,
For primary bibliographic entry see Field 5D.
W76-00433

DAIRY WASTE MANAGEMENT ALTERNATIVES,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 5D.
W76-00434

EUTROPHICATION IN THE GREAT PLAINS,
Oklahoma Cooperative Fishery Unit, Stillwater.
For primary bibliographic entry see Field 5B
W76-00437

FARM EFFLUENT--ELECTRICAL DISPOSAL METHODS,
For primary bibliographic entry see Field 5D.
W76-00438

LAND DISPOSAL OF LIVESTOCK WASTE,
Maryland Univ., College Park. Co-operative Extension Service.
H. L. Brodie, and J. T. Kennedy.
Agricultural Engineering Release No 54, Environmental Series No 5, Cooperative Extension Service, University of Maryland, College Park, 1972. 3 p, 2 ref.

Descriptors: *Water pollution, *Livestock, Lagoons, Erosion, Agricultural runoff, *Waste disposal, *Farm wastes, Waste water treatment, *Farm lagoons.
Identifiers: *Land disposal.

The production and waste management practices used by farmers determine the extent of water pollution caused by their animal production units. Land spreading of animal wastes is a very effective method of preventing water pollution because of the natural treatment process in the soil. Several means of applying the principle of intercepting and controlling surface and subsurface waters are listed. Watersheds are affected a great deal more by natural pollutants than by animal wastes which are properly spread on land where erosion is controlled. Crop rotation, strip cropping, pasture improvement and the growing of crops for protective cover are the most common erosion control procedures. A list of steps to take in the prevention of pollution from land disposal of livestock wastes is given. Alternate methods of land application during the fall are provided. The best way to judge application rate is from experience by considering slope, slope length, soil type and ground cover. Two obstacles to winter spreading are frozen soil and deep snow. During the winter if a good spreading schedule cannot be followed, the manure should be stored under cover. Additional information on managing lagoons to capture runoff and minimize overflow is provided. If animal production units are properly located and managed, groundwater problems are minimized. (Kehl-East Central Oklahoma State)
W76-00440

LAGOONS FOR ANIMAL WASTE DISPOSAL,
Auburn Univ., Ala. Cooperative Extension Service.
H. Watson.
Circular R-6, Auburn University, July, 1972, 12 p, 6 tab, 3 ref.

Descriptors: *Waste disposal, Lagoons, *Design, *Management, *Biochemical oxygen demand, Poultry, Livestock, *Farm wastes, *Farm lagoons, Waste water treatment.
Identifiers: Water volumes, Sludge removal, Lagoon overflow, Loading.

For several years lagoons have been used for the disposal of livestock and poultry manure with varying degrees of success. A lagoon's effectiveness is determined by its design, construction and management. The two major advantages of lagoons are: (1) the labor requirements are less than for systems where manure is spread on fields and (2) lagoons usually can be constructed at a low initial cost. There are three major disadvantages of lagoons. (1) Objectionalbe odors are sometimes present, (2) Improper construction c

present a possible source of ground and surface water pollution, and (3) Periodic sludge removal is required. The processes of three lagoon types, aerobic, anaerobic and mechanically aerated lagoone, are discussed. The location, size and construction are examined as important factors in lagoon design. Tables for BOD productions and surface area requirements, water volumes for various aerator sizes and for water volumes of various anaerobic lagoons are given. The operation and management of a lagoon are explained through the various loading methods, sludge removal and lagoon overflow. Some general management practices that should be followed are given. (Kehl-East Central Oklahoma State)
W76-00441

EFFECTS OF APPLICATION RATE IN DIRECT LAND DISPOSAL OF ANIMAL WASTES,
Kansas State Univ., Manhattan. Dept. of Agronomy.
L. S. Murphy, G. W. Wallingford, and W. L. Powers.
Journal of Dairy Science, Vol 56, No 10, p 1367-1374, October, 1973. 8 fig, 4 tab.

Descriptors: *Farm wastes, Effects, *Solid wastes, *Liquid wastes, Feed lots, Dairy industry, Soils, Chemical properties, Nitrates, Salinity, Phosphorus, Waste disposal, *Rates of application.
Identifiers: *Land disposal, Colloidal dispersion.

Land disposal of animal wastes is a viable solution to the water pollution problem, but this disposal must be done with care so that new pollution problems don't arise. Excess application of manure can cause excess salinity, nitrates, and/or phosphorus as well as colloidal dispersion. A literature review is given to show the beneficial and detrimental value of manure applications on crops and on soil chemical properties. It was concluded that disposal of both solid and liquid wastes should be accompanied by regular soil analysis to detect accumulation of waste components or reaction products which may be detrimental to both the soil and to underlying aquifers. (Battles-East Central Oklahoma State)
W76-00443

CONTROLLING MANURE RUNOFF,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W76-00444

SEALING OF ANAEROBIC DAIRY WASTE LAGOONS IN SANDY, HIGH WATER TABLE SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-00445

A SYSTEMS APPROACH TO CATTLE FEEDLOT POLLUTION CONTROL,
Texas Tech Univ., Lubbock. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W76-00446

THE DESIGN AND OPERATION OF AN OPEN-FRONT, SLOTTED FLOOR BEEF CONFINEMENT BUILDING,
Illinois Univ., Urbana. Cooperative Extension Service.
For primary bibliographic entry see Field 5D.
W76-00447

GUIDELINES ON LIVESTOCK WASTE CONTROL FACILITIES.
Nebraska State Dept. of Environmental Control, Lincoln.
For primary bibliographic entry see Field 5D.
W76-00453

RUNOFF CONTROL FOR A CREEK BANK FEEDLOT,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5D.
W76-00454

NEBRASKA ANIMAL WASTE RESEARCH,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5D.
W76-00455

AN ANALYSIS OF BEEF CATTLE FEEDLOT DESIGNS FOR POLLUTION CONTROL,
Agricultural Research Service, Lincoln, Nebr. Agricultural Engineering Research Div.
For primary bibliographic entry see Field 5D.
W76-00457

THINK OF MANURE AS A RESOURCE, NOT A WASTE,
Agricultural Research Service, Lincoln, Nebraska.
For primary bibliographic entry see Field 5D.
W76-00459

NUISANCE LAWSUITS--NEIGHBOR VS. NEIGHBOR.
For primary bibliographic entry see Field 5G.
W76-00460

ANIMAL WASTE IN THE U. S. A.,
Massachusetts State Dept. of Agriculture, Worcester. Poultry Husbandry Adviser.
For primary bibliographic entry see Field 5D.
W76-00463

TREATMENT OF ANIMAL WASTES AT THE GREENFIELD LABORATORIES OF ELI LILLY AND COMPANY,
Lily (Eli) and Co., Greenfield, Ind. Greenfield Labs.
For primary bibliographic entry see Field 5D.
W76-00464

COORDINATED LIVESTOCK PRODUCTION SYSTEMS,
Department of Agriculture, Lincoln, Nebr.
For primary bibliographic entry see Field 5D.
W76-00465

SWINE MANURE LAND APPLICATION RATES.
Hog Farm Management, Vol 9, p 32-33, February 1972. 1 tab.

Descriptors: *Waste disposal, *Nitrogen, *Indiana, Water pollution, *Ammonia, Waste treatment, Hogs.
Identifiers: *Land disposal, *Loading rates, Salt buildup.

Land application of swine manure is recommended as a means of protecting surface and ground water from nitrogen phosphorus excesses, of removing bacteria and pathogens through the 'living filter' operation, of improving soil structure, and of least-cost disposal. Nitrogen should not be returned to the land in excess of crop use. The amount of manure per acre to contain this amount of nitrogen depends on the animal ration, the ammonia conversion and denitrification before application, the crop type, and the climate. Typical values for swine wastes on various crops in Indiana are tabulated. Salt buildup should also be considered. (East Central Oklahoma State)
W76-00466

FEEDLOT ODOR,
For primary bibliographic entry see Field 5D.
W76-00467

HANDLING MILKING-PARLOR WASTE,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-00469

SUMMARY OF SYMPOSIUM ON CONVERSION OF POULTRY WASTE.
For primary bibliographic entry see Field 5D.
W76-00476

DUMPS: A POTENTIAL THREAT TO GROUND WATER SUPPLIES,
Environmental Protection Agency, Washington, D.C. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5B.
W76-00487

INDUSTRIAL REFUSE INCINERATION IN THE ROTARY KILN (INDUSTRIEMUELL VERBRENNUNG IM DREHROHROFEN).
Umweltshutz-Staedtereinigung, Vol 12, No 6, p 159-160, June, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical wastes, *Incineration, Plastics, Paper, Oil wastes, Air pollution, Standards.
Identifiers: Rotary kiln.

The synthetic leather manufacturing plant in Chropyne near Gottwaldov, Czechoslavakia, disposes of all solid and liquid wastes ranging from paper, plastic production wastes, and trash to solvents, old oil, aqueous dimethylformaide solution and sludges from electroplating by incineration in a rotary kiln. The kiln has been designed for a throughput of 200 to 570 kg/hr solid and pasty material. In the afterburning chamber, 200 kg/hr of liquid waste material can be burned. The waste gases from the incineration process are cooled to 300 C by injection of air and discharged through a stack. The waste gas volume was measured to be 15,000 cu m/hr. The waste gases contain approximately 500 mg dust/cu m, 100 ppm CO, between 20 and 100 ppm SO2, 80 ppm nitrogen oxides of which 0.5 to 3.0 ppm are NO2, and between 300 and 1100 ppm HCl. Although the waste gas quality does not meet the requirements of established guidelines, Czech emission limits are not exceeded. The kiln has been in operation for approximately 2500 hr without major problems. (Nave-FIRL)
W76-00495

5F. Water Treatment and Quality Alteration

HYDRAULIC MODEL STUDY OF A SETTLING BASIN,
Illinois State Water Works Association, Vol 67, No 7, p 367-372, July 1975. 7 fig, 2 tab, 2 ref.
For primary bibliographic entry see Field 8B.
W76-00022

CHEMISTRY OF WATER SUPPLY, TREATMENT, AND DISTRIBUTION,
Ohio State Univ., Columbus. Water Resources Center.
A. J. Rubin.
Ann Arbor Science Publishers, Ann Arbor, Michigan, 1974, 446 p.

Descriptors: *Water supply, *Water treatment, *Water distribution(Applied), Water quality standards, Potable water, Water quality, Nutrients, Lakes, Gas chromatography, Disinfection,

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Analytical techniques, Cadmium, Arsenic compounds, Sulfur compounds, Coagulation, Sands, Filtration, Manganese, Oxides, Cations, Activated carbon, Organic compounds, Chlorine, Chlorination, Bacteria, Viruses, Bromine, Viricides, Trace elements, Water pollution sources.
Identifiers: Chelates, Alum, Hypochlorous acid, Hypochlorites.

Of the 18 chapters contributed by different experts, about one-half were originally presented at an American Chemical Society Symposium (April 1973 National Meeting). They deal with thse following topics: Criteria development for national drinking water standards; nutrient inputs to lakes and their effects on water quality; gas-chromatographic analysis of volatile metal chelates; new analytical techniques for study of water disinfection; removal of Cd, As, and S compounds from waters; effect of Al(III) hydrolysis on alum coagulation; models and filters for removing colloidal Mn oxides with selected cations as filter aids; influence of surface oxides on adsorption and catalysis with activated carbon; desorption of organic compounds by activated carbon; interaction of chlorine with activated carbon; dynamics of breakpoint chlorination; equilibria in aqueous solutions of chlorinated isocyanurate; effectiveness of hypochlorous acid and hypochlorite ion in destroying viruses and bacteria; kinetics of viral inactivation by bromine and ozone; and effects of water treatment and distribution of trace element concentrations. A subject index is appended. (See also W76-00103 thru W76-00120) (Brown-IPC)
W76-00102

CRITERIA DEVELOPMENT FOR NATIONAL DRINKING WATER STANDARDS,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
G. G. Robeck.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 1-9. 4 ref, 1 tab.

Descriptors: *Potable water, *Water quality standards, Mercury, Arsenic compounds, Phenols, Pesticides, Water quality, Water properties, Water quality control, Water treatment.

The selection of criteria and examples of adequate and inadequate bases for drinking water standards are considered. Factors affecting the establishment of standards are discussed, and reasons for selecting a constituent and its limit for drinking water standards are illustrated for mercury, arsenic, carbon chloroform extracts, carbon alcohol extracts, phenol, and several pesticides. Many of the criteria are based on limited data and analytical methods, and more research is required on the physiological effects, measurement techniques, and treatment of contaminants in order to develop creditable standards. (See also W76-00102) (Witt-IPC)
W76-00103

NEW ANALYTICAL TECHNIQUES FOR THE STUDY OF WATER DISINFECTION,
Alabama Univ., University. Dept. of Civil and Mineral Engineering.
G. P. Whittle, and A. Lapteff, Jr.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 63-88. 6 fig, 16 ref, 3 tab.

Descriptors: *Water analysis, *Disinfection, *Analytical techniques, *Chlorine, Manganese, Chemical reactions, Chlorination, Water quality, Chemical analysis, Color reactions, Water chemistry, Water treatment.
Identifiers: Choramine, Nitrogen trichloride.

The leuco crystal violet method proposed by Black and Whittle in Journal American Water Works Association, Vol 59, p 607-619 (1967), has been modified to determine concentrations of free chlorine, mono- and dichloramine, and nitrogen trichloride as high as 10 mg/liter Cl. The original method is based on the reaction of chlorine or iodine with N,N-dimethylaniline at pH 4 to produce a bluish-violet color with an absorbance peak at 592 nm. Details of the modified procedures are given. Mn(IV) interferes with the determinations. It is believed these new methods will prove useful in research studies to elucidate the chemistry of chlorine reactions and disinfection processes and in application to water and waste water chlorination practice. (See also W76-00102) (Witt-IPC)
W76-00106

REMOVAL OF CADMIUM FROM WATERS AND WASTES BY SORPTION ON HYDROUS METAL OXIDES FOR WATER TREATMENT,
Monroe County Community Coll., Mich.
For primary bibliographic entry see Field 5D.
W76-00107

CHEMISTRY OF SULFUR SPECIES AND THEIR REMOVAL FROM WATER SUPPLY,
University of Southern California, Los Angeles. Environmental Engineering Program.
K. Y. Chen.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 109-135. 11 fig, 29 ref.

Descriptors: *Sulfur compounds, *Water treatment, *Water chemistry, Hydrogen sulfide, Sulfur, Sulfides, Oxygenation, Water supply, Aeration, Chlorination, Ozone, Oxidation, Water pollution sources, Water quality control, Water quality, Waste water treatment, Pollution abatement.
Identifiers: *Polysulfides, Thiosulfate, Chlorine dioxide, Potassium permanganate.

An overall review is presented of the chemistry of sulfur compounds in dilute aqueous solution as related to water treatment practices, with special emphasis on the removal of sulfides. The topics discussed include: equilibrium chemistry of sulfur species (elemental sulfur, hydrogen sulfide, polysulfides, thiosulfate) in aqueous solution; chemistry or oxygenation of sulfide; and the removal of sulfides from water supplies by aeration, chlorination, ozonization, and oxidation by potassium permanganate and chlorine dioxide. (See also W76-00102) (Witt-IPC)
W76-00108

CHEMICAL FORMS OF ARSENIC IN WATER SUPPLIES AND THEIR REMOVAL,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
J. F. Ferguson, and M. A. Anderson.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 137-158. 8 fig, 29 ref, 2 tab.

Descriptors: *Waste water treatment, *Arsenic compounds, Pollutants, Chemicals, Toxicity, Natural streams, Adsorption, Iron, Aluminum, Alkalis(Bases), Water pollution sources, Pollutants, Toxicity, Iron oxides.
Identifiers: Aluminum hydroxide.

This review covers the chemical species of As present in natural waters, the possible conversions between species, and the significance of species on As removal technology. Included are a discussion of the removal of different forms of As and a description of the results of experimental work on adsorption of As onto amorphous ferric and aluminum hydroxides. (See also W76-00102) (Witt-IPC)
W76-00109

EFFECT OF ALUMINUM(III) HYDROLYSIS ON ALUM COAGULATION,
Ohio State Univ., Columbus Water Resources Center.
A. J. Rubin, and T. W. Kovac.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 159-179. 10 fig, 24 ref.

Descriptors: *Titanium dioxides, *Coagulation, *Chemical precipitation, *Colloids, Hydrogen ion concentration, Water treatment, Water purification, Chemical reactions, Separation techniques, Hydrolysis, Water chemistry, Solubility, Turbidity, Water properties, Waste water treatment, Aluminum.
Identifiers: *Aluminum sulfate, Aluminum hydroxide.

As with other sols the stability of colloidal titanium dioxide is dependent on solution pH and aluminum sulfate concentration. At high pH the sol slowly coagulates. Above pH 6 it is stable in Al(III) solutions of concentration less than 8 times 10 to the minus 9th molar. This critical coagulation concentration is lower than has been reported for other sols. The left and right stability limits defining the zone of rapid clarification are identical with the solubility limits of aluminum hydroxide. Aggregation in the sweep zone is controlled by the parameters affecting the solutility of the hydroxide precipitate. (See also W76-00102) (Witt-IPC)
W76-00110

MODEL SAND FILTERS FOR THE REMOVAL OF COLLOIDAL MANGANESE OXIDES USING SELECTED CATIONS AS FILTER AIDS,
Wyoming Univ., Laramie. Dept. of Civil Engineering.
S. R. Jenkins, J. Engeset, and V. R. Hasfurther.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 181-199. 12 fig, 17 ref.

Descriptors: *Manganese, *Colloids, *Water treatment, *Filtration, Cations, Separation techniques, Water purification, Filters, Sands, Hydrogen ion concentration, Calcium, Ions, Sodium, Water pollution sources, Model studies, Oxides, Inorganic compounds, Water quality control, Waste water treatment, Pollutants.
Identifiers: Manganese oxides.

Previous work by other workers has indicated that the most predominant form of manganese oxides precipitated on oxidation of Mn(II) during treatment of manganese-bearing waters is a mixture of $Na_4Mn_{14}O_{27}$ and Mn_7O_{13} (delta-manganese oxides). The removal of these oxides from aqueous solution by filtration through sand columns was examined. The solutions were filtered at the rate of 2 gal/min/sq ft for 45 minutes, and the amount of delta-manganese oxides passing the filter was determined as a function of time. After the 45 minute filter run, the manganese oxide solution was removed, and the amount of delta-manganese oxides adhering to the sand was determined. The effects of pH, precoating, filtration rate, and cation on the effectiveness of the filter to remove the oxides were studied. The Ca ion concentration necessary to produce maximum removal of delta manganese oxide particles is stoichiometric with the concentration of delta-manganese oxides. The first concentration of Ca necessary to produce the maximum effectiveness is termed the maximum effectiveness concentration (MEC) of the filter aid. Differences in pH affected the MEC of Ca only slightly. Precoating the sand with calcium ion causes considerable change in the effectiveness of Ca in aiding delta-manganese oxide removal. If Na ion is used instead of Ca as the filter aid, the MEC of Na agrees well with values reported by others for aggregation of hydrophobic colloids. This aggregation is promoted by double-layer compaction rather than specific chemical interaction. (See also W76-00102) (Witt-IPC)

W76-00111

INFLUENCE OF SURFACE OXIDES ON ADSORPTION AND CATALYSIS WITH ACTIVATED CARBON,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-00112

ACTIVE CARBON: DECHLORINATION AND THE ADSORPTION OF ORGANIC COMPOUNDS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-00113

INTERACTIONS OF AQUEOUS CHLORINE WITH ACTIVATED CARBON,
Delaware Univ., Newark. Dept. of Civil Engineering.
L. L. Olson, and C. D. Binning.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 253-295. 15 fig, 53 ref, 5 tab.

Descriptors: *Chlorine, *Activated carbon, *Adsorption, *Water treatment, Water properties, Water purification, Water quality control, Temperature, Kinetics, Chlorides, Byproducts, Water pollution sources, Water pollution control, Chlorination, Disinfection.
Identifiers: Darco G-60, Nuchar C-1000N carbon, Elovich equation.

Aqueous chlorine solution and activated carbon were mixed at pH 10 and 5.5 in a Nalgene reaction chamber immersed in a water bath. At predetermined intervals, aliquots were removed and filtered, analyzed for chlorine and carbon-oxides, and passed through Darco G-60 and Nuchar C-1000N activated carbon. Adsorption capacities were determined by agitating 1 g of the carbon in 100 ml of 0.25 normal barium hydroxide for 48 hr, allowing the mixture to settle, and titrating the supernatant with 0.1 normal HCl. The rates of chlorine removal are determined and shown in plots. The data indicate that the removal of aqueous chlorine from solution using activated carbon is a two-stage process, each having a characteristic rate of removal. The removal of aqueous chlorine fits Elovich's equation. The effects of temperature, amount of chlorides and protons produced, production of by-products, and redosing on the rate of removal are also discussed. (See also W76-00102) (Witt-IPC)
W76-00114

DYNAMICS OF BREAKPOINT CHLORINATION,
Northeast Univ., Boston, Mass. Dept. of Civil Engineering.
I. W. Wei, and J. C. Morris.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 297-332. 18 fig, 12 ref, 3 tab.

Descriptors: *Chlorination, *Ammonia, *Water purification, Reduction(Chemical), Chlorine, *Water treatment, Chemical reactions, Hydrogen ion concentration, Kinetics, Disinfection, Water chemistry, Waste water treatment.
Identifiers: Chloramine.

A kinetic study of the redox reaction between chlorine and ammonia in dilute aqueous solutions with pH 6.7-7.2 at 5-20 C is described. The study focused on the dynamics of the process during the initial stages (in the first hour). The formation of chloramine was very rapid and its subsequent decrease fast in all instances. As soon as the free chlorine concentration became constant, the decrease of chloramine followed a first-order rate law. The analysis showed that the concentration of chloramine increased during the early stages of the breakpoint process, reached a maximum after several minutes, and the declined as the reduction of chlorine proceeded. The concentration of free chlorine decreased as HOCl reacted in the formation of chloramines and then reached a relatively constant level, in most instances, before completion of the breakpoint process. The rate of the overall breakpoint reaction, as measured by the rate of decrease of total chlorine, decreased as the pH decreased. (See also W76-00102) (Witt-IPC)
W76-00115

EQUILIBRIA IN AQUEOUS SOLUTIONS OF CHLORINATED ISOCYANURATE,
Lawrence Experiment Station, Mass.
J. E. O'Brien, J. C. Morris, and J. N. Butler.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 333-358. 9 fig, 6 ref, 4 tab.

Descriptors: *Aqueous solutions, *Chlorine, *Computer programs, *Water treatment, Water purification, Chlorination, Equilibrium, Water quality control, Chemical reactions, Water chemistry, Disinfection, Reservoirs, Hydrolysis, Bactericides.
Identifiers: *Cyanurates, *Isocyanurates.

A computer program has been developed for calculating all chemical species as a function of reservoir chlorine, total cyanurate, and pH from individual acidity and hydrolysis constants in solutions of chlorine and cyanurate. Although chlorinated cyanurates serve as a reservoir of free chlorine, bactericidal efficacy is more closely related to the relatively small fraction of free chlorine present at equilibrium. Therefore, the use of excessive cyanurate in an overly zealous attempt to reduce photolysis may repress free chlorine to the point of suppressing germicidal activity. For the same reason the continual addition of chlorinated cyanurates as a source of chlorine is not recommended because this will lead to buildup of cyanurate concentration. (See also W76-00102) (Witt-IPC)
W76-00116

EFFECTIVENESS OF HYPOCHLOROUS ACID AND HYPOCHLORITE ION IN DESTRUCTION OF VIRUSES AND BACTERIA,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
P. V. Scarpino, M. Lucas, D. R. Dahling, G. Berg, and S. L. Chang.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 359-368. 4 fig, 8 ref.

Descriptors: *Disinfection, *Viruses, *Bacteria, *Chlorination, E. coli, Coliforms, Bacteriophage, Water purification, *Water treatment, Water pollution sources, Water quality control, Chlorine, Waste water treatment, Bactericides, Viricides.
Identifiers: *Hypochlorous acid, Hypochlorite, Poliovirus, Coxsackievirus.

The disinfecting ability of chlorine and chlorine compounds in the treatment of water and waste water has been known for many years. However, little information is presently available concerning the inactivation of animal viruses in water and waste water by chlorine and its compounds. The inactivation of DNA phages T2 and T5, RNA phages f2 and MS2, Escherichia coli ATCC 11229, and two animal viruses, poliovirus type 1 and coxsackievirus A9, at 5 C and pH 6 and 10 and free chlorine levels of 0.01-10 mg/liter was studied. The greater resistance of the two animal viruses compared to the faster kill exhibited by the four bacteriophages and the test bacterium points out that the use of coliphages and even an important member of the total coliform and fecal coliform groups, i.e., E. coli, as indicators of enteric virus pollution of disinfection water is of questionable validity. Inactivation of the animal viruses was more rapid at pH 10 where the free chlorine is in the form of monovalent hypochlorite ion rather than HOCl. (See also W76-00102) (Witt-IPC)
W76-00117

KINETICS OF VIRAL INACTIVATION BY BROMINE,
National Inst., for Occupation Safety and Health, Cincinnati, Ohio.
D. G. Taylor, and J. D. Johnson.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 369-408. 15 fig, 54 ref, 3 tab.

Descriptors: *Viricides, *Bromine, *Disinfection, Kinetics, *Water treatment, Water purification, Water pollution sources, Water quality control, Microorganisms, Waste water treatment, Viruses.
Identifiers: *Hypochlorous acid, *Hypobromous acid, *Nitrogen tribromide.

Hypobromous acid, molecular bromine, and nitrogen tribromide were tested at pH 4.5 and 0 C for their virucidal activity and compared to the activity of hypochlorous acid against the bacterial virus phiX174am3. The relative rates of virus inactivation are in descending order, molecular bromine, hypochlorous acid, hypobromous acid, and nitrogen tribromide, at a concentration of 1 micromole. (See also W76-00102) (Witt-IPC)
W76-00118

INACTIVATION OF VIRUSES AND BACTERIA BY OZONE,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
E. Katzenelson, B. Kletter, H. Schechter, and H. I. Shuval.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 409-421. 8 fig, 10 ref.

Descriptors: *Viruses, *Ozone, *Bacteria, *Disinfection, *Water treatment, Water purification, Water pollution sources, Water quality control, E. coli, Coliforms, Chlorine, Microorganisms, Aquatic microorganisms, Bactericides, Viricides.
Identifiers: Poliovirus.

The inactivation of poliovirus type 1, coliphage T2, and Escherichia coli by ozone (0.01-2.5 mg/liter) at 1 and 5 C was studied. The results clearly show the effectiveness of ozone in inactivating microorganisms. Lower concentrations of ozone and shorter contact times are required than are needed with chlorine or other disinfectants. (See also W76-00102) (Witt-IPC)
W76-00119

THE EFFECT OF WATER TREATMENT AND DISTRIBUTION ON TRACE ELEMENT CONCENTRATIONS,
Pittsburgh Univ., Pa. Graduate School of Public Health.
J. B. Andelman.
In: American Chemical Society Symposium on the Chemistry of Water Supply, Treatment, and Distribution, April, 1973, Dallas, Texas, p 423-440. 30 ref, 12 tab.

Descriptors: *Trace elements, *Water treatment, *Water sampling, *Water distribution(Applied), Water supply, Diseases, Water quality standards, Public health, Municipal water, Potable water, Water quality, Sampling, Epidemiology, Water analysis, Water chemistry.
Identifiers: Silver.

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There is some epidemiological evidence relating the trace element content of municipal water supplies to chronic disease, especially cardiovascular diseases. At present, the evidence is quite inconclusive and the possible mechanisms are generally uncertain. A survey of community water supplies has shown that for all the trace elements for which there are mandatory U.S. Public Health Service standards, only silver is not found in distribution system samples above the maximum permissible concentrations. The concentrations of trace elements and their variations in raw water supplies are of prime importance in relation to the ultimate quality of the finished water reaching the consumer. Trace element concentration of raw water varies widely with geographic location and time. Water treatment can, in some cases, increase trace element concentrations in municipal water. The distribution process can also affect the concentration of trace elements. All these variables emphasize the need for a carefully designed sampling scheme in attempting to determine the concentrations of trace elements to which humans are exposed through their drinking water. The need to sample at the terminals of the distribution system, rather than at the treatment plant, is especially important. (See also W76-00102) (Witt-IPC)
W76-00120

A STUDY OF THE TREATMENT OF LAKE MICHIGAN WATER USING DIRECT FILTRATION,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. D. Letterman.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 768, $5.25 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 102, 1975. 102 p, 35 fig, 7 tab, 25 ref. OWRT A-062-ILL (5). 14-31-0001-5013.

Descriptors: Lake Michigan, *Filtration, Pilot plants, *Water treatment, Flocculation, Polyelectrolytes, Coagulation, Filters, *Pretreatment(Water).
Identifiers: *Direct filtration, *Filter beds.

The direct filtration process can be an effective and economical alternative to the conventional sequence of operations used for water clarification. In most cases, the process has been used to treat water with a consistently low turbidity. Its effectiveness in other cases, e.g., treating water from Lake Michigan, will require a thorough understanding of process behavior and control techniques. Pilot plant studies were performed using a constant-rate dual-media filter preceded by a pretreatment reactor in which a cationic polyelectrolyte coagulant was added. For each filter design and set of operating conditions there is an optimum distribution of deposit within the filter bed at run termination which maximizes the water production per filter run. The pretreatment conditions (the polyelectrolyte concentration and the mixing intensity and duration) can be used to maximize the water production per filter run and maintain an acceptable effluent turbidity. The pretreatment conditions determine the rate of clogging front advancement in the filter bed, which, in conjunction with the terminal headloss, determines the distribution of deposit within the bed at run termination.
W76-00175

BENEFICIAL RECYCLING OF WASTE,
Bauer, Sheaffer, and Lear, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-00182

WATER TREATMENT PLANT, CITY OF QUEBEC, CANADA,
Quebec City Water Board (Quebec). Water Div.
V. Paquet.
Journal of the New England Water Works Association, Vol 89, No 2, p 111-120, June, 1975.

Descriptors: *Water treatment, *Treatment facilities, *Screens, *Flocculation, *Filtration, Ozone, Odors, Tastes, Neutralization, Coagulation, Lime, Chlorine, Mixing, Settling basins, Color, Canada, Filter.
Identifiers: Mixed media filtration, Alum.

Treatment of water at the Quebec City Water Treatment Plant, Quebec, Canada, is described. Screening is performed through 8 mesh rotary screens at the water intake. Raw water is pumped into a pipe where chemicals, such as chlorine, alum, hydrated lime, and coagulant aids are added to extract color and earthy materials. Mixing is aided by the use of helico-agitators. Water then overflows into ribbon type flocculators. The heavy floc formed settles easily in a settling tank. Treated water from the settling tanks flows into a water canal which feeds 16 filters which have a filtration capacity of 3 migpd. The filters are multilayer type filters with gravel, sand, and anthracite. Filtered water is treated with ozone to eliminate tastes and odors. Prior to distribution, the water is neutralized with hydrated lime. Technical information is presented concerning nominal capacity, cost, electrical installation, mechanical installation, treatment, and, main characteristics of the water treatment plant. (Orr-FIRL)
W76-00205

IMPROVEMENTS TO NEW BEDFORD'S WATER SUPPLY,
New Bedford Water Dept., Mass.
E. E. Begin, and R. D. G. Monk.
Journal of the New England Water Works Association, Vol 89, No 2, p 145-160, June, 1975. 3 fig, 3 tab.

Descriptors: *Water supply, *Water treatment, *Potable water, *Treatment facilities, Reservoirs, Water supply development, Water works, Water requirements, Water sources, Administration, Massachusetts.
Identifiers: New Bedford(Mass).

Improvements to the water supply of New Bedford, Massachusetts, are necessitated by the fact that the old system has reached its limit of productivity. A decrease in water quality in recent years will be corrected by the construction of a treatment plant. The plant is designed to remove color, iron, manganese, taste, and odor. Chlorine disinfection and soda ash addition for corrosion control will be continued. A new raw water pipe will connect the existing transmission mains to the treatment plant. Pre-treatment will be performed in carbon contact, mixing and flocculation basins, followed by two-story sedimentation basins provided with mechanical sludge scrapers. The filters will consist of anthracite coal and sand, and have a filtration rate of 6 gpm/sq at 45 mgd. Alum and quicklime will be used for coagulation. Activated carbom will be used for taste and odor control. Potassium permanganate will be used as an oxidizing agent for the removal of iron and manganese. Total cost of the treatment plant will be $15.5 million. The municipal water reservoir has been covered. A new pumping station is designed to improve the existing high service facility. The main proble facing New Bedford is an inadequate water supply. Suggested plans for augmenting the supply are described. Completion of all phases of the improvement program will satisfy the requirements of New Bedford until the design year 2000. (Orr-FIRL)
W76-00206

ECONOMIZING IN DESIGN WITHOUT SACRIFICING QUALITY,
Whitman and Howard, Inc., Boston, Mass.
S. Medlar.
Public Works, Vol 106, No 6, p 96-98, June, 1975. 3 fig.

Descriptors: *Water treatment, *Potable water, *Treatment facilities, Filtration, Construction, Automation, Water distribution(Applied), Water pollution control, Massachusetts, Costs.
Identifiers: Automatic backwash filters, Chemical treatment, Fall River(Mass).

A new 24 mgd water treatment facility is being built at Fall River, Massachusetts. Past water treatment had been chlorination and sodium hydroxide treatment and did not consistently provide water which met U. S. Public Health Service drinking water standards. The new filtration plant was designed so as to minimize construction and operating costs without sacrificing water quality. Treatment consists of flash mixing, flocculation, sedimentation, and rapid sand mixing; basins for the first three steps are built beneath the ground so that tank roofs are a foundation for buildings housing equipment and an administration area. Water will flow by gravity from North Watuppa Pond to the treatment facility, where it is clarified. It is then distributed to rapid sand filters, which are of the automatic backwash type. After filtration, pH is adjusted for corrosion control, the water is chlorinated, and it enters a clear well to be pumped into the distribution system. Chemicals including liquid alum, liquid sodium hydroxide, chlorine gas, fluoride, polyelectrolyte, and powered activated carbon are fed automatically into the water, proportional to flow. A central control area, connected with alarm circuits to monitor key functions in the plant and the distribution system, is also described. (Kramer-FIRL)
W76-00208

EXPERIMENTS ON FLUID BED TREATMENT USING PETROLEUM-BASED SPHEROIDAL DUST COAL, (IN JAPANESE),
S. Atuta, and Y. Mori.
Journal of the Japan Water Works Association, No 489, p 39-60, June, 1975. 50 fig, 16 tab, 4 ref.

Descriptors: *Odor, *Activated carbon, *Water treatment, Pilot plants, *Treatment facilities.
Identifiers: Fluid bed process, Charcoal, *Japan.

Experiments have been made to solve an odor problem which occurs each spring and early summer at Imbanuma, the source of water for the Chiba Prefectural Waterworks Bureau, in Japan. Both laboratory studies and field surveys have been conducted. A recently developed method using a fluid bed process with high fluidity activated charcoal, was very effective. This process was less expensive and easier to control than the conventional fixed bed process. The new fluid bed system is being tested on a pilot scale and initial results are detailed. (Kramer-FIRL)
W76-00211

POLYMER APPLICATIONS INCREASING IN WATER AND WASTE TREATMENT,
For primary bibliographic entry see Field 5D.
W76-00212

WATER-DISINFECTION CHALLENGERS NOW ON TAP,
L. J. Ricci.
Chemical Engineering, Vol 82, No 17, p 49-51, August 18, 1975. 1 tab.

Descriptors: *Water treatment, *Public health, *Ozone, Activated carbon, Potable water, Disinfection, Water purification, Treatment facilities, Irradiation, *Waste water treatment.
Identifiers: Chemical treatment, Ozonation, Chlorination alternatives.

Possible health hazards from chlorination disinfection of water as a result of the reaction of chlorine residuals with organic contaminants have been revealed. As a result, alternative methods of water treatment, including ozonization and irradiation, are being considered to remove the precursors of volatile organics. The advantages and disadvantages of activated carbon, ozone, alternativ

hemicals such as iodine, bromine, bromide chloride, and potassium permanganate, irradiation lone or with ozone, and ultraviolet radiation with ozone are discussed. Ozonization is the most successful alternative to chlorination and is widely sed in France, West Germany, and Moscow for otable water treatment. While ozonization roduces no chlorinated organics and provides ood disinfection, its dosage must be carefully nonitored for complete purification, as it leaves o residual for continued disinfection. In the Jnited States, the first large scale ozone plant to reat waste water will be operating by next year to rocess 4 mgd in Southern Trumbell County, Ohio. Smaller facilities in Woodlands, Texas; Springfield, Missouri; Estes Park, Colorado; and ndiantown, Florida have chosen ozone for waste vater disinfection. (Kramer-FIRL)
V76-00215

CANADA PIONEERS LARGE-SCALE OZONE PLANTS.
For primary bibliographic entry see Field 5D.
W76-00216

EXPERIMENTAL STUDY ON DIRECT COAGULATION FILTRATION METHOD. (CHOKUSETSU GYOSHU ROKA-HO NI KANSURU JIKKEN KEKKA),
S. Tsunoda, and Y. Aoyagi.
Suido Kyokai Zasshi, (Journal of Japan Water Works Association), No 486, p 2-10, March, 1975. 4 fig, 3 tab, 18 ref.

Descriptors: *Filtration, *Coagulation, Hydrogen ion concentration, Potable water, *Water treatment, Turbidity, Waste water treatment, Kaolinite.
Identifiers: Filtration mechanisms.

The effect of pH on the filtration mechanisms in a direct coagulation filtration method was studied experimentally. An artificially turbid water was prepared by dissolving 20 ppm kaolinite into drinking water, adjusting the solution pH, adding polyaluminum chloride or aluminum sulfate as the coagulation agent, and filtering by a sand column. The zeta potential between the top of the sand column and 20 cm depth from the top was measured in relation to the solution pH or the filtration time. When polyaluminum chloride was employed as the coagulant, the optimum pH for the coagulation filtration occurred at 4 to 5. This is not in the pH range shown to be for the strongest coagulation force, and the mechanism of the removal of suspended particles by the sand at this pH range was the sand covering action. The mechanism for the solution with a pH of 6 to 9 was a blockade type, since the coagulation force between the suspended particles and coagulant was greater, resulting in the formation of larger particles. For the aluminum sulfate experiments, the optimum coagulation filtering occurred at a pH of 6 to 6.5 and the mechanism was the sand covering type; however, the mechanism for the solution with a pH above 7 was a blockade type and the leakage of coagulated particles from the sand column occurred in a short time. For both coagulants the kaolinite concentration in the column effluent decreased to less than one ppm for their optimum pH conditions. (Katayama-FIRL)
W76-00217

PLAN AND DESIGN OF SLUDGE TREATMENT FACILITIES OF NISHINAGASAWA PURIFICATION PLANT, (IN JAPANESE),
M. Nishizuka, T. Kudo, and R. Yamane.
Journal of Japan Water Works Association, No 489, p 61-78, June, 1975. 9 fig, 14 tab, 5 ref.

Descriptors: *Water treatment, *Sludge treatment, *Water purification, Dewatering, Drying, Design, *Treatment facilities, Waste treatment.

Surveys and experiments were conducted by the Kanagawa Water Supply Authority to aid in choosing a system for the sludge treatment facilities of the Nishinagasawa Purification Plant. The system chosen was a combined granulation dehydration and drying system. The system became operable in April of 1974. A brief history of the decision to adopt the new system is given. The design of the system is also discussed. (Orr-FIRL)
W76-00220

UPFLOW FILTER FOR POTABLE WATER PRODUCTION,
Walk, Haydel and Associates, Inc., New Orleans, La.
B. J. Haney, and S. E. Steimle.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE4, p 489-502, August, 1975. 6 fig, 4 tab, 33 ref, append.

Descriptors: *Potable water, *Water treatment, *Filtration, *Filters, Reliability, Operating costs, Efficiences, Surges, Chemicals, Turbidity, Coliforms, Operations.
Identifiers: *Upflow filtration, *L'Eau Claire Process.

The operational reliability of a patented upflow filtration system (the L'Eau Claire Process) for the production of potable water was investigated. The upflow unit was subjected to upset conditions that are critical in both downflow and upflow filtration. The L'Eau Claire system with effluent disinfection was an effective self-contained means of potable water production. Turbidity removal was very good. Effluent averages were consistently below the American Water Works Association goal of 0.1 Jtu. Substantial coliform reduction occurred; average effluent levels were consistently below 50 coliforms/100 ml. The filter operated at filtration rates greater than 6 gpm/sq ft and as high as 10 gpm/sq ft. The L'Eau Claire system will react consistently to upset conditions. A loss of chemical upset will result in elevated effluent turbidity and coliform values 15 minutes after the loss of chemical. Values will increase until the chemical feed is resumed. Efficiency will not be reduced as a result of the loss and subsequent resumption of chemical. Increased effluent turbidity and coliform values will occur with an air injection upset. Values will peak in the first 15 minutes of the upset. Power failure upsets will be more critical at the beginning of the cycle than at the end. Surge upset will cause small increases in effluent turbidity and coliform values. Recovery from all upsets will occur 15 minutes after the upset condition is removed. The L'Eau Claire system can result in operational and capital costs savings. (Orr-FIRL)
W76-00222

EFFECT OF MEDIA INTERMIXING ON DUAL MEDIA FILTRATION,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-00223

HIGH-RATE WATER TREATMENT: THE STATE-OF-THE-ART,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
P. H. King, R. L. Johnson, C. W. Randall, and G. W. Rehberger.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE4, p 479-488, August, 1975. 4 fig, 9 tab, 5 ref, append.

Descriptors: *Water treatment, *Filtration, *Hydraulic design, Economics, Water quality control, Treatment facilities, Virginia, Mixing, Flocculation, Sedimentation, Water softening, *Reviews.
Identifiers: *High-rate treatment processes, Hydraulic loading rates.

One of the major advances in water treatment technology has been the application of processes operating at substantially higher hydraulic loading rates than previously used. A survey was recently conducted by the ASCE-EED Committee on Water Purification of state regulatory agencies to determine the prevailing concept of high-rate water treatment and to determine their attitude toward the various methods presently used. Treatment processes considered include flash mixing and flocculation units, sedimentation basins, filtration, and softening. The large majority of the states which responded indicated favorable experience with high-rate treatment plants. Operating data from four high-rate water treatment plants in Virginia were studied. The water produced by each of these plants was consistently of high quality; no significant turbidity breakthrough occurred during the study. The Committee has concluded that a broader based concept of high-rate treatment that includes other units as well as filtration units needs to be developed. When designing a water treatment plant, the entire system, from rapid mix to final stabilization and disinfection, should be considered as a single entity to obtain the optimum and most economical solution for each plant. High-rate treatment should include realistic loadings on flash mixing, flocculation, and sedimentation basins, and on solids contact units as well as filtration units. The Committee concludes that there are economic advantages in high-rate treatment processes which can be gained without sacrificing the quality of the water produced. (Orr-FIRL)
W76-00226

FILTER PLANT MODIFICATIONS FEATURE WASTEWATER RECOVERY,
Robert and Co., Associates, West Palm Beach, Fla.
J. H. Weaver.
Public Works, Vol 106, No 8, p 66-68, August, 1975. 6 fig.

Descriptors: *Water treatment, *Treatment facilities, *Water supply, Reservoirs, Water shortage, Screens, Filters, Florida.
Identifiers: Tampa(Fla), Dual media filters, Mechanical sludge collectors.

Although the City of Tampa, Florida, is involved in a long range study of expanding its water capacity, it was decided that immediate steps should be taken to avoid problems in the event of prolonged periods of dry weather within the next two or three years. Three areas were identified that could provide quick solutions at the lowest cost: the potential raw water supply could be increased by lowering the reservoir intake; the direct loss of water from the system caused by wasting filter backwash into the river could be eliminated; and, the storage capacity and processing volume of the settling basins could be increased by modification of existing basins and building two new ones plus modification of filters. A new reservoir intake was installed about 5.5 feet below the level of the existing intake, adding about 572 million gallons of usable capacity. Improvements to the intake system included: trash rakes to remove debris from the trash bars; travelling water screens to remove finer particles not collected by the bars; and, vertical pumps that do not need priming. To increase the time between backwashing operations, all filters were converted to dual media (anthracite coal and sand). The duration of filter runs has been increased about 50%. The minimum hydraulic capacity has been increased from 2 gpm/sq ft to 3 gpm/sq ft. The filter backwash is now collected in an equalization basin and recycled into the system. Some of the older existing settling basins had a loss of capacity due to the build up of sludge deposits on the bottom. Mechanical sludge collectors were installed. These move continuously across the bottom of the basin, collecting sludge at one end where it is pumped to drying beds or into the sanitary sewer. (Orr-FIRL)
W76-00227

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NEW WATERWORKS IN STOCKHOLM,
K. Baeckstroem.
ASEA Journal, Vol 48, No 2, p 27-34, 1975. 13 fig.

Descriptors: *Water treatment, *Treatment facilities, Automatic control, Control systems, Computers, Equipment, Instrumentation, Power operation and maintenance, Power system operation, Electric power, Electrical equipment.
Identifiers: *Stockholm, *Sweden.

A brief description is presented of the electrical power, process control, and computer equipment for the new East Norsborg Waterworks in Stockholm, Sweden. In the first stage, the waterworks has a capacity of 200,000 cu m/day, which will eventually be doubled. This is the first waterworks in Sweden to operate with an electronic operating system and computer control. Equipment for the power supply includes: switch gear; automatic change-over system; and power-factor correction. The speed of the raw water pump motors is controlled by means of three thyristor convertor cascades. The main control board is built from mosaic modules and includes the necessary instrumentation, controls, signalling devices, and mimic diagrams. Units for the electronic control of different process components include: operating and indicating modules; operating and indicating printed-circuit boards; and, motor starter groups in the switch-gear. The operating system incorporates integrated fault annunciator equipment; each fault is identified as to which object is faulty and what the type of fault is. To reduce the amount of work involved and speed up the restarting time, an automatic zero voltage system is provided which ensures that in the event of a loss of voltage certain valves are set to the positions which they should occupy during start-up. Rapid sand filters and aluminum sulfate dosage control systems are discussed. Automatic measuring systems monitor flow, pressure, level, energy, weight, concentration, turbidity, and pH. The computer system is reponsible for data acquisition, processing, storage, logging, process control, monitoring, alarms, and statistical processes. (Orr-FIRL)
W76-00228

PARTICLES, POLYMERS, AND PERFORMANCE IN FILTRATION,
Quanta Consulting Engineers, Tehran, Iran.
For primary bibliographic entry see Field 5D.
W76-00229

STUDIES ON USE OF FLYASH IN CONJUNCTION WITH ALUM FOR COAGULATION OF TURBID WATER,
Calcutta Univ. (India). Dept. of Applied Chemistry.
M. Adhikari, S. K. Gupta, and R. D. Biswas.
Journal of the Institution of Engineers (India), Vol 55, Part Ph 2, p 33-36, February, 1975. 2 tab, 19 ref.

Descriptors: *Water treatment, *Coagulation, *Fly ash, Daphnia, Chemical precipitation, Water purification.
Identifiers: *Alum, Alum sludge.

An investigation was conducted to determine whether fly ash could be used alone or in combination with alum or alum sludge for the coagulation step in water treatment. River water samples were collected from the Ganges River (India) from a fixed depth of the basin throughout the representative seasons of the year. A sample of fly ash from a boiler plant was collected from the Palta Water Works. It was pretreated by washing with distilled water to remove free alkali and passing the dried mass through a 100 mesh sieve. Large, well formed flocs tended to settle well and removal of turbidity was satisfactory in the case of high turbidity water. The decrease in alum requirement with fly ash was small at lower levels of turbidity. Additions of sludge and fly ash were effective up to a certain concentration of ash. The order of the addition of the coagulant and the ash was a determining factor. Efficiency of coagulation was found to depend largely on the extent of dispersion. The joint influence of ash and sludge is more than an additive function. The recycling of fresh sludge and ash treatment in coagulation reduces the time of settling up to 33.33%, minimizes the problem of sludge disposal and decreases the cost of coagulant required. The most efficient bacterial kill was observed with a combination of sludge and ash. Fly ash also increases the removal of water fleas (Daphnia) by sedimentation and therefore reduces the load on the filtration units. The use of fly ash in combination with alum does impart some advantages from the point of view of efficiency of treatment and also results in cost savings because of reduced alum requirements. (Orr-FIRL)
W76-00232

FLUORIDATION ANALYSIS: THE BOSTON STORY,
Boston Metropolitan District Commission, Mass.
J. J. Matera.
Journal of the American Water Works Association, Vol 67, No 8, p 459-462, August, 1975. 3 fig, 1 tab.

Descriptors: *Water treatment, *Fluoridation, Distribution systems, Mixing, Public health, Aqueducts, Reservoirs, Water quality control, Monitoring, Potable water, Massachusetts, *Treatment facilities.
Identifiers: Boston(Mass).

The objective in fluoridation of a water system is to achieve a concentration of residual fluoride ion in the range from 0.9 to 1.1 mg/liter consistently throughout the entire distribution system. The Boston, Massachusetts, Metropolitan District water supply system made an analysis of its distribution system in order to determine alternatives for fluoride injection and monitoring locations. Two alternative locations for injection points were identified: alternatives I, fluoridation of major distribution reservoir outlets; and, alternative II, fluoridation on the aqueducts from the water supply reservoirs. The advantages and disadvantages of each alternative location, based on consideration and evaluation of existing facilities at each site, are presented in detail. A schematic diagram is given of the aqueducts and storage reservoirs showing the alternative location of fluoridation points. Alternative II was chosen as the most feasible location. Alternative II requires one less chemical storage and feed building and monitoring station than alternative I. It also provides for better centralization of facilities for chemical delivery and system operation, control, and maintenance and provides the best opportunity for diffusion and mixing of the fluoride solution. (Orr-FIRL)
W76-00233

CHICAGO'S SWITCH TO FREE CHLORINE RESIDUALS,
Chicago Dept. of Water and Sewers, Ill. Water Purification Div.
B. F. Willey, C. M. Duke, and J. Rasho.
Journal of the American Water Works Association, Vol 67, No 8, p 438-441, August, 1975. 2 fig, 15 ref.

Descriptors: *Water treatment, *Chlorination, *Distribution systems, Water quality control, Samples, Illinois.
Identifiers: Chicago(Ill), Free chlorine residuals.

Chicago, Illinois, practiced superchlorination prior to coagulation, sedimentation, and filtration followed by postchlorination and ammoniation as water entered the distribution system until January, 1973, when the filtration plants coverted to providing free chlorine residuals throughout the city. The results of the first year of operation are discussed. There were 70 more taste or odor complaints in 1973 than in 1972; only one person in 50,000 noticed the change enought to notify wa quality surveillance personnel. Average chlori residuals leaving the plant have been held close 0.75 mg/liter of free chlorine and 0.12 mg/liter combined chlorine. The city instituted an E ployees Sampling Program whereby frequent sa pling of home taps of scientific and technical p sonnel of the water department would be made increase the division's already established sa pling program. In 1973, an average of 741 samp per month were reported. Conferences held w the distribution division uncovered areas wh valve readjustment could improve flow patter Controlled-flushing of fire hydrants, and a p gram of more frequent surveillance has impro areas of low flow or dead ends. (Orr-FIRL)
W76-00236

MEMBRANE PROCESSES FOR WAT TREATMENT, CONCLUSION,
Aberdeen Univ., (Scotland). Dept. of Chemistr
For primary bibliographic entry see Field 3A.
W76-00241

A LABORATORY STUDY OF RDX ADSO TION BY CARBON,
Army Mobility Equipment Research and Deve ment Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 5D.
W76-00247

REMOVAL OF F2 VIRUS FROM RIV WATER BY ARMY WATER PURIFICATI UNITS,
Army Mobility Equipment Research and Deve ment Center, Fort Belvoir, Va.
A. Ford, Jr., and M. Pressman.
Available from the National Technical Infor tion Service, Springfield, Va 22161, as AD/A 557, $3.75 in paper copy, $2.25 in microfiche. port No 2109, August, 1974. 24 p, 3 fig, 10 tab.

Descriptors: *Water purification, *Riv *Reverse osomosis, Polyelectrolytes, *Viru *Water treatment, Filtration, Coagulation, collection, Coliforms, Pre-treatment.
Identifiers: *f2 virus, Pressure filtration.

A field study was conducted at Fort Meade, M land, to investigate the capabilities of two w purification systems in removing coliform or isms and f2 bacteriophage from the water o Little Patuxent River. These purification sys were a prototype, 360 gph reverse osmosis w purification unit and a standard, 420 gph, v purification unit. From data gathered, it was cluded that both the prototype and the stan water purification unit were capable of effect reducing the concentrations in a natural wat coliform organisms and f2 virus to undetec levels. The prototype reverse osmosis operated with cationic polyelectrolyte addi prefiltration, and hypochlorination and the dard unit employed coagulation, diatomite f tion, and hypochlorination. Additionally, it found that dual-media pressure filtration a gal/min/sq ft, with cationic polyelectrolyte tion, used as pre-treatment with the reverse o sis unit, was capable of removing 99.99% added f2 virus from a natural water. Virus re in this operation was the same after filter r and following backwash with clarified or raw water. (Kramer-FIRL)
W76-00251

POLIOVIRUS INACTIVATION BY ACTIV SLUDGE,
Texas Univ., at Austin. Dept. of Civil Engine and Texas Univ. at Austin. Dept of Environm Health Engineering.
For primary bibliographic entry see Field 5D.
W76-00256

GIANT 1 472 ML/D WATERWORKS AT GARDEN REACH, CALCUTTA,
Calcutta Metropolitan Planning Organization (India).
R. N. Mukherjee.
Journal of the Institution of Engineers (India), Vol 55, Part PH2, p 43-45, February, 1975.

Descriptors: *Water treatment, *Water supply, *Treatment facilities, Coagulation, Flocculation, Filters, Potable Water.
Identifiers: Calcutta(India).

The Calcutta Metropolitan Planning Organization, India, found that existing water treatment facilities at Palta provide an inadequate water supply. A new facility, the Garden Reach Water Treatment Plant was proposed to serve the southern part of the Metropolis. The river Hooghly will be the source of water supply, with the planned construction of a dam (the Farrakka Barrage) to increase water quality and quantity. Treatment will consist of: presettlement of raw water for six hours in a raw water lake; prechlorination of the silted water to control bacteriological and algal growth; coagulation; flocculation and suspended solids; filtration through rapid sand filters; and post-chlorination. An underground filtered water reservoir of 82,000 cu m will receive filtered water. When completed, the facility will be the largest in Asia and will produce 1,472 Ml/d filtered water for Calcutta. (Kramer-FIRL)
W76-00260

WHY CHLORINATE,
British Columbia Dept. of Health, Vancouver.
G. Duffield.
Water and Pollution Control, Vol 113, No 8, p 27-28, August, 1975.

Descriptors: *Chlorination, *Disinfection, *Water treatment, *Groundwater, *Surface waters, Chlorine, Water pollution control, Monitoring, *Canada, Watershed management.

The use of chlorination is defended as a necessary method of water treatment in Canada. While other possible methods of disinfection--ozone, chlorine dioxides, or ultraviolet light--may be implemented, chlorine is the only one to leave a residual. Chlorine in a small fraction of a ppm amount will not protect a given system against massive infiltration, a cross connection, or a main break. However, the purpose of such a chlorine residual is to serve as an indicator that the system is in good condition. If a system is regularly monitored for the residual and if is found that the residual has at some point disappeared, then the cause of the irregularity should be investigated. The need for chlorination disinfection in a watershed is supported by the multiple uses of a natural body of water, whereby bacteria may enter into the system from an animal population or from the disposal of sewage. Groundwater sources should be chlorinated to protect against iron- or sulfate-reducing forms of bacteria which might cause undesirable tastes or odors, colored water, slime growths, or equipment corrosion. While a recent EPA report found 66 compounds in the New Orleans' water supply which are combinations of chlorine and organic chemicals, and may be carcinogenic, this argument is countered by the fact that there is not enough evidence that the drinking of chlorinated water causes cancer. Chlorine is argued to still be the best disinfectant available for water treatment and bacterial control. (Kramer-FIRL)
W76-00261

ACIDIFIED ALUM SLUDGE AND FLY-ASH AS ADJUNCT TO COAGULATION,
Calcutta Univ. (India). Dept. of Applied Chemistry.
M. Adhikari, S. K. Gupta, and R. D. Biswas.
Journal of the Indian Chemical Society, Vol 52, No 2, p 127-130, February, 1975. 4 tab, 33 ref.

Descriptors: *Water treatment, *Municipal water, *Flocculation, Bacteria, Coagulation, Sludge, Rivers, Potable water, Coliforms, Fly ash.
Identifiers: Sulfated sludge, Phosphated ash, India, *Alum sludge.

The possibility of using acidified alum-sludge and acidified fly-ash as adjuncts to coagulation in the treatment of river water for municipal supply, and their capability to reduce coliform bacterial count and algae population in the usual alum coagulation process was investigated. A comparison of actural alum requirements and those when it is used together with sulfated or phosphated sludge and with sulfated or phosphated ash was made. Sulfated sludge and phosphated ash reduced the settling time and floc formation by 33% and 50%, respectively. The application of these adjuncts was found to minimize the disposal problem and to reduce the capital costs of chemical treatment. Sulfuric acid treated sludge was the most effective adjunct for water in the higher turbidity range. Coliform counts were also successfully diminished in supply water and the flocculation of both phytoplanktons and zooplanktons usually present in river water was initiated. (Kramer-FIRL)
W76-00262

SHALLOW DEPTH SEDIMENTATION-A RATIONAL APPROACH TO WATER AND WASTEWATER CLARIFICATION,
National Environmental Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5D.
W76-00263

WATER TREATMENT PLANTS DESIGNED AT MELYEPTERV FOR FOREIGN CUSTOMERS (MELYEPTERV ALTAL KULFOLDRE TERVEZETT VIZKEZELO BERENDEZESEK),
Melyepterv, Budapest (Hungary).
T. Satorhelyi.
Heidrologiai Kozlony, Vol 55, No 6, p 263-265, June, 1975. 3 fig.

Descriptors: *Water treatment, *Treatment facilities, *Design, Foreign research, Automation, Control systems, Power operation and maintenance.
Identifiers: Hungary.

Since 1968, the Hungarian company, Melyepterv, has prepared designs for water treatment plants in Lebanon, Yugoslavia, Czechoslovakia, and the German Democratic Republic, as well as in Hungary. The water treatment plants designed at Melyepterv are constructed under the supervision of the designer, who also participates in the testing and pilot operation of the plants. The facilities are designed according to the most advanced technologies and high aesthetical standards are reached by observing the latest principles in power supply and automatic controls. (Orr-FIRL)
W76-00269

TREATMENT OF SURFACE WATERS FOR DOMESTIC SUPPLY (FELSZINI VIZEK KEZELESE IVOVIZ CELJARA),
Melyepterv, Budapest (Hungary).
A. Polhydy.
Hidrologiai Kozlony, Vol 55, No 6, p 245-250, June, 1975. 3 fig, 1 tab, 5 photos.

Descriptors: *Water treatment, *Treatment facilities, *Potable water, Surface waters, Water resources, Oxidation, Adsorption, Filters, Coagulation, Activated carbon, Ozone, Control systems, Instrumentation, Equipment, Foreign research, *Design, *Water supply.
Identifiers: *Hungary.

The use of surface waters rather than groundwater resources as a source of drinking water became prevalent in Hungary about 20 years ago. In order to obtain the same quality of drinking water as from groundwater, advanced treatment of the surface waters must be performed. The professionals engaged in water treatment design at the Melyepterv facility have developed the designs for ten major surface waters treatment plants, with capacities ranging from 5 to 200 thousand cu m/day. The raw water for domestic supply use is diverted from the Danube and the Tisza rivers. The treatment plants include advanced drum filters, complex chemical feeding devices, clarifiers and filters. Suspended and dissolved solids are removed by oxidation, adsorption, chemical coagulation, and filtration. The newest plants are also designed using ozone treatment and activated carbon filtration. Melyepterv has developed floating silt blanket clarifiers which are provided with multiple controls to manage difficult treatment problems. The large open filters employed are designed with corrosion resistant and economical filter bottoms and are equipped with electric controls. A high standard of operation at the treatment plants is facilitated by advanced instrumentation and laboratory equipment, by extensive remote controls, and by mechanical equipment which eliminates much of the physical labor. (Orr-FIRL)
W76-00270

CONTROL OF SURFACTANT POLLUTION,
Palta Water Works, Barrackpore (India). Water Lab.
S. K. Gupta, R. D. Biswas, and K. Ghosh.
Indian Journal of Environmental Health, Vol 17, No 1, p 21-25, January 1975. 2 fig, 1 tab, 5 ref.

Descriptors: *Surfactants, *Water treatment, Rivers, Coagulation, Recycling, Waste disposal, Foreign research, Water pollution control, *Fly ash.
Identifiers: *Alum sludge, Chemical treatment, *India(Ganga River).

A method was investigated for the removal of surfactant pollution from river water by the application of prime coagulant alum together with either fly ash or alum sludge. Both alum sludge and fly ash from water treatment stations had been considered useless by-products which caused their own disposal problems. Experiments were performed on water samples from the Ganga River collected at the Palta Water Works, Barrackpore, India. These samples contained the anionic surfactants sodium dodecyl benzene sulfonate (NaDBS) and sodium dodecyl sulfate (NaDS) and the cationic surfactants cetyl trimethyl ammonium bromide (CTAB) and cetyl pyridirium chloride (CPYCl). The solutions of river water containing these surfactants were treated with variable doses of alum together with fly ash or alum sludge. The remaining surfactant concentrations were evaluated by the surface tension measurements at 30 C, representing the amount of surfactant absorbed. As was shown graphically, both fly ash and alum sludge, when applied together with the prime coagulant alum, were able to minimize the surfactant concentration in the river water samples. (Kramer-FIRL)
W76-00273

HOW CAN YOU COPE WITH SHORTAGES.
New York City Dept. of Water Resources.
J. T. Egan, and N. Nash.
Water and Wastes Engineering, Vol 11, No 11, p 50-52, November, 1974.

Descriptors: *Chlorine, *Water treatment, *Waste water treatment, *Alternative planning, Chemical engineering, Sanitary engineering, Sewage treatment.
Identifiers: Shortages, Standby systems, New York City, Sodium hypochlorite.

The problem of a chlorine shortage is compounded by several factors including: (1) disinfection must be continuous once it is begun, (2) a trace quantity of the disinfectant in the distribution system is generally required by health agencies, (3) chlorine feed equipment is not readily adaptable to use of

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other substances, and (4) the replacement of chlorine feed equipment with other mechanisms requires substantial periods of time. Short term substitutes are difficult to come by but long term solutions or back up units have some advantages. These are: (1) iodine, less reactive than chlorine, longer retention time of its residual and more effective against virus, but may have detrimental long term effects on pregnant women, infants and persons with thyroid disease. (2) ozone, effective but expensive to apply and potentially harmful, (3) ultraviolet radiation, effective for small scale systems but area necessary for large volume treatment is very large. Metal ions such as copper, silver, and mercury are expensive, potentially very harmful and are not recommended. Bromine produces irritating fumes and requires extra safety equipment. Potassium permanganate and hydrogen peroxide have long contact time and high dosages with only partial reduction or microorganisms. For sewage treatment chlorine is the best available until more is learned about ozone effects. Iodine, bromine, ultraviolet radiation, and chlorine dioxide are much less effective. Sodium hypochlorite, has been in use since 1964 in New York City, is useful and little elaborate equipment is necessary. However, the bulk necessary is large and the cost is twice that of liquid chlorine. (Bradbeer-NWWA)
W76-00282

CHECK SAMPLING FOR MONITORING BACTERIOLOGICAL QUALITY.
Missouri State Div. of Health, Jefferson City. Bureau of Water Supply.
For primary bibliographic entry see Field 5A.
W76-00391

VIRUS PROBLEMS AND THEIR RELATION TO WATER SUPPLIES,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 5A.
W76-00392

5G. Water Quality Control

RIVER QUALITY AND INDUSTRIAL ADJUSTMENT: A CASE STUDY,
Western Michigan Univ., Kalamazoo.
F. C. Emerson.
Environmental Affairs Vol 3, No 1, p 188-198, 1974. 21 ref. 2 tab.

Descriptors: *Rivers, *Water quality, *Michigan, *Pulp wastes, Pulp and paper industry, Pollution abatement, Water pollution sources, Wastes, Industrial wastes, Treatment facilities, Waste water treatment, Great Lakes Region.
Identifiers: Kalamazoo River(Mich), Waste paper, Writing paper, Printing paper.

The Kalamazoo River in Lower Michigan has several paper mills located adjacent to it or one of its tributaries and was considered the most polluted river in the state. The improvement of water quality in the river in the last several years has come about as a result of the construction of a municipal-industrial waste water treatment facility and a reduction in total waste load to the river by the paper mills. The latter was the result of mill closings, changes in production processes, better control of effluent discharges, and most of all, a decline in the use of waste paper for the production of writing and printing papers. (Witt-IPC)
W76-00039

WATER QUALITY-LIMITED APPROACH TO EFFLUENT REDUCTION IN PAPER MANUFACTURE,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, Mich. Central-Lake States Regional Center.
A. M. Springer, D. W. Marshall, and W. J. Gillespie.
In: Proceedings of the 29th Industrial Waste Conference, Purdue University, May 7-9, 1974. p 945-963, 7 fig, 8 ref, 18 tab.

Descriptors: *Water reuse, *Pulp and paper industry, *Waste water(Pollution), Water conservation, Recirculated water, Slime, Odor, Corrosion, Scaling, Biochemical oxygen demand, Water pollution sources, Water pollution control, Industrial water.
Identifiers: *Paperboard mills.

On the basis of a 13-mill survey (Conducted by the National Council of the Paper Industry for Air and Stream Improvement), it appears that combination paperboard mills can tighten their water systems to the level of 200-300 gal of effluent/ton of product without major difficulties. Beyond this level, problems such as slime, odor, corrosion, scale, product mottle, and plugging are observed. The loading of BOD as measured in terms of BOD discharged/ton of product produced can be significantly reduced with a water reuse program. (Sykes-IPC)
W76-00048

PANEL ON DISCIPLINE VIEWPOINTS AND POSITIONS: ECOLOGY,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 6G.
W76-00064

AN ASSESSMENT OF UNIVERSITY INTERDISCIPLINARY RESEARCH: THE WISCONSIN RIVER AND THE LOWER FRASER RIVER WATER QUALITY STUDIES,
British Columbia Univ., Vancouver. Westwater Research Centre.
A. H. J. Dorcey, and I. K. Fox.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 320-357, 1975. 3 fig, 1 ref, 2 append.

Descriptors: *River basin development, *Projects, *Water quality, *Management, Water policy, Research, Assessment, Decision making, Evaluation, Human population, Behavior, Social aspects, Feasbility, Standards, Wastes, Coordination, Universities, Pollution abatement, Planning, Economics, Mathematical models.
Identifiers: *Interdisciplinary analysis, *Wisconsin River, *Lower Fraser River(Brit. Columbia), Multi-disciplinary, Least-cost, Economic analysis, Policy analysis, Public involvement, Institutional arrangements.

Findings are reported from two large and complex interdisciplinary water research projects, one in Wisconsin River and the other in the Lower Fraser River. Both projects have been conducted under auspices of a unversity, have included participants from the physical, biological, and social sciences, and have provided an improved foundation for policy and institutional development for water quality management in these two rivers. Part I of this report defines some termiology that is used extensively throughout the paper and specifies the major premises which govern the authors' assessment. Part II is devoted to the Wisconsin River study and provides a broad outline of the nature of the project, how it was conducted, and what it did and did not accomplish. The Wisconsin River study focused upon a pollution problem along a 180 mile reach of the river, water quality degradation being largely a result of waste discharge by 15 pulp and paper mills. Among the study objectives was to determine the nature of least-cost systems for achieving specified patterns of water quality in the river and to compare these costs with those under existing policies. Part III characterizes the Lower Fraser Project, a more comprehensive undertaking than the Wisconsin River Project due to size of flow and amount of industry. Part IV is the authors' assessment which reflects their current thinking about what factors determine whether or not an interdisciplinary research project will be successful. (See also W76-00060) (Bell-Cornell)
W76-00077

DISCUSSION (OF, 'AN ASSESSMENT OF UNIVERSITY INTERDISCIPLINARY RESEARCH: THE WISCONSIN RIVER AND THE LOWER FRASER RIVER WATER QUALITY STUDIES,' BY A. H. J. DORCEY AND I. K. FOX),
Colorado Univ., Boulder. Inst. of Behavioral Science.
K. R. Hammond.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 358-363, 1975. 1 fig.

Descriptors: *River basin development, *Projects, Decision making, Water policy, Management.
Identifiers: *Interdisciplinary analysis, *Wisconsin River, *Human judgment, *Policy process, Rational policy.

The paper by Fox and Dorcey describes a valuable interdisciplinary project aimed at providing technical scientific data to aid decision makers to derive rational, infomred policies regarding management of the Wisconsin River. In order to influence public policy development, however, we need much more information about the policy-process itself. Specifically, we need to know much more about the role of human judgment in that process and most important, we must learn how to improve the competence of human judgment, so that rational means can produce rational policy. The present study provides an excellent example of an attempt to increase the interdisciplinary character of scientific and technical efforts in order to guide the policy-process in the direction of increased rationality. (See also W76-00060) (Bell-Cornell)
W76-00078

PROBLEMS IN INTEGRATING WATER PROGRAMS,
Environmental Protection Agency, Washington D.C. Office of Water Programs.
E. T. Jensen.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, paper No. 11202, Vol 101, No HY3, p 467-470, March 1975.

Descriptors: *Water quality, *Water quantity, *Management, *Programs, *Hydraulics, Water resources development, Water law, Water policy, Planning.
Identifiers: *Government agencies, Strategy, Fragmentation.

Water quality management was for many years considered to be an entity apart from other professional disciplines involved in water resource management. The recent national focus on water quality problems has resulted in the development of a nationally uniform body of law setting forth national goals, a detailed planning process, and mechanisms for implementing these plans. The national programs for water quality are unified and integrated at the state and Federal levels between state and Federal agencies. In contrast, however, the more general water resources programs are badly fragmented with diffuse national leadership and poor state/Federal communications. There is no uniform body of law for the quantitative use and management of our water resources. Massive reorganization of the Federal water resource agencies might (or might not) provide a better framework for the nation's water resource program. It appears that the Water Resources Council offers the best hope of program articulation at the Federal

evel. At the state level, the 'policy approach' now eing used by Virginia may be helpful, but additional experience will be necessary. (Bell-Cornell)
W76-00082

MPLEMENTATION OF INTERSTATE WATER QUALITY PLAN,
Delaware River Basin Commission, Trenton, N.J.
. H. J. Hull.
ournal of the Hydraulics Division, Proceedings of he American Society of Civil Engineers, Vol 101, No HY3, Paper No 11177, p 495-509, March 1975. fig, 1 tab, 17 ref.

Descriptors: *Water resources, *Water quality control, *Regional planning, *Interstate commissions, Estuaries, Groundwater, *Delaware River Basin Commission, *Comprehensive planning, Management, Tidal waters, Pollution abatement, River basins, Standards, Streamflow, Regulation, Dissolved oxygen.
Identifiers: Administrative law, Sea water intrusion, Assimilative capacity, Sewerage regionalization, Salinity control.

The water quality control plan of the interstate Delaware River Basin is part of a multifunctional master plan for water resources conservation, development, and management in the 13,000-mile, four-state region. The master plan, or Comprehensive Plan, is required by the Delaware River Basin Compact and has the force of law. No project or development affecting the water resources of the Basin can be undertaken if it is in conflict with the Comprehensive Plan, which includes policies, standards, criteria, and general goals, as well as physical projects and facilities, deemed necessary by the Delaware River Basin Commission for the purpose of the Compact. The water quality plan is being implemented by the Basin community under the guidance and regulatory control of the Commission. Compliance is effected by: mandatory consultative planning between the Commission and sponsors of projects that may influence water quality; and formal detailed review of water-related projects before construction approval is granted by the Commission. (Bell-Cornell)
W76-00083

STRESS DETERMINATION BY HYDRAULIC FRACTURING IN SUBSURFACE WASTE INJECTION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5E.
W76-00089

CRITERIA DEVELOPMENT FOR NATIONAL DRINKING WATER STANDARDS,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 5F.
W76-00103

OIL POLLUTION OF THE SEA AND THE PETROLEUM INDUSTRY (VERTIDOS AL MAR EN LA INDUSTRIA DEL PETROLEO),
J. Albaiges-Riera.
Quimica e Industria, Vol 21, No 3, p 249, 252-253, 255, 257, March, 1975. 3 fig, 4 tab, 9 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Water pollution control, Oceans, Water pollution sources, Environmental effects, Aquatic organisms, *Oil pollution, Separation techniques.

A detailed review is presented of the main causes of contamination of sea water by petroleum and petroleum products, the effects of such events, and measures taken to combat this pollution. The main causes of oil pollution are spills during transport and during offshore drilling, and dumping of industrial effluents into the sea from refineries. Surface and depth pollution, distrubance of marine ecology, proliferation of undesired marine fauna, and poisoning or flavor alteration of edible aquatic species are some of the environmental effects. Abatement measures include: processing of effluents; regulatory legislation for offshore drilling; greater precautions against accidental spills; introduction of air cooling and recycling processes; and, treatment of effluents by decantation, flotation, biological degradation, and other biological and physico-chemical methods. (Morrow-FIRL)
W76-00127

ANY CAR REPAIR SHOP CAN HAVE ITS OWN EQUIPMENT FOR THE TREATMENT OF USED OIL EMULSIONS (OGNI OFFICINA MECCANICA PUO AVERE IL SUO IMPIANTO PER IL TRATTAMENTO DELLE EMULSIONI OLEOSE ESAUSTE).
For primary bibliographic entry see Field 5D.
W76-00130

WATER RESOURCES DEVELOPMENT BY THE U. S. ARMY CORPS OF ENGINEERS IN NEVADA: 1975.

Descriptors: *Water resources development, *Flood control, *Flood plain zoning, *Project planning, Water management, River basin development, Water resources, Water supply, Water utilization, Navigation, Water quality control, Water pollution control, Recreation, Maps, Nevada, Multiple-purpose projects, Dams, Civil engineering, Surveys.

Information is provided on Corps of Engineers participation in water resources development in the state of Nevada including: the role of the Corps in planning, constructing, and operating water resources development projects; on active investigations; and on projects that are completed, under construction, or in the planning stage. The majority of information describes flood control projects and flood plain management services. Data on investigations and projects are grouped by Nevada subregions, which have been selected on the basis of major drainage patterns. (Robinett-Arizona)
W76-00184

WATER RESOURCES DEVELOPMENT BY THE U. S. ARMY CORPS OF ENGINEERS IN ARIZONA: 1975.
U. S. Army Corps of Engineers, South Pacific Division, San Francisco, California, 1975. 81 p, 48 fig, 21 tab.

Descriptors: *Water resources development, *Water supply, *Flood control, *Flood plain zoning, *Project planning, River basin development, Water resources, Water utilization, Recreation, Water quality control, Dams, Water pollution control, Maps, Arizona, Multiple-purpose projects, Civil engineering, Water management, Surveys.

Information is given on the scope and progress of current programs in the state of Arizona, with the majority describing flood control projects and flood plain management services. The report contains information on Corps of Engineers participation in water resources development; on the role of the Corps in planning, constructing, and operating water resources development projects; on active investigation; and on projects that are completed, under construction, or in the planning stage. Data on ivestigations and projects are grouped by Arizona subregions, which have been selected on the basis of major drainage patterns. (Robinett-Arizona)
W76-00185

WATER RESOURCES DEVELOPMENT BY THE U. S. ARMY CORPS OF ENGINEERS IN UTAH: 1975.
U. S. Army Corps of Engineers, South Pacific Division, San Francisco, California, January, 1975. 45 p, 22 fig, 4 tab.

Descriptors: *Water resources development, *Flood control, *Flood plain zoning, *Project planning, *Water management, River basin development, Water resources, Water supply, Water utilization, Navigation, Water quality control, Water pollution control, Recreation, Great Salt Lake, Utah, Maps, Multiple-purpose projects, Dams, Civil engineering.

Information is provided on the scope and progress of current programs in the state of Utah, with the majority of information describing flood control projects and flood plain management services. Information is presented on Corps of Engineers authorities for participating in water resources development; on the role of the Corps in planning, constructing, and operating water resources development projects; on active investigations; and on projects that are completed, under construction, or in the planning stage. Data on investigations and projects are grouped by basins, which have been selected on the basis of major drainage patterns. (Robinett-Arizona)
W76-00186

UPGRADING LAGOON EFFLUENT FOR BEST PRACTICABLE TREATMENT,
Brown and Caldwell, Walnut Creek, California.
For primary bibliographic entry see Field 5D.
W76-00240

COMPUTER MODEL GUIDES SALT WATER WELL CONSTRUCTION,
EBA Engineering Consultants Ltd. Edmonton (Alberta).
For primary bibliographic entry see Field 5A.
W76-00285

FERTILIZER APPLICATION RATES AND NITRATE CONCENTRATIONS IN ILLINOIS SURFACE WATERS,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 5B.
W76-00290

UPCONING OF THE SALT-WATER--FRESH-WATER INTERFACE BENEATH A PUMPING WELL,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W76-00295

THE CATASTROPHIC DRIFT OF STREAM INSECTS AFTER TREATMENTS WITH METHOXYCHLOR (1,1,1-TRICHLORO-2,2-BIS(P-METHOXYPHENYL) ETHANE),
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-00327

ARE DRILLERS LEGALLY RESPONSIBLE FOR GROUND WATER POLLUTION,
W. N. Walker.
Water Well Journal, Vol 24, No 3, p 31-36, March, 1975.

Descriptors: *Legal aspects, *Pollution, *Water wells, Adjacent land owners, Civil law, Judicial decisions, Water rights, Water law, Legislation, Groundwater.
Identifiers: Driller liability, Legal responsibility, Drillers.

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The types of events encompassed in this analysis are generally those where a contractor drilling a well on one piece of property is alleged to have caused pollution of a well serving a neighboring piece of property. This report is not intended to reflect the law of any particular state. It is designed as a research aid to acquaint the practitioner with the principles he should take into consideration in preparing his case and the arguments he is likely to face. Very few reported cases have been discovered dealing with water well driller's liability; most of those cited deal with oil and gas wells. Plaintiffs may seek to establish liability on any one (or more) of three grounds: negligence, liability without fault, and anti-pollution statutes. Each involves different elements and must be defended on different grounds. Each is discussed separtely. Plaintiff has a second burden in addition to that of proving breach of a duty, common law or statutory. He must also show that the defendent's (driller's in these cases) act was the proximate cause of the alleged injury. Trial tactics are suggested which defense counsel may wish to consider in suits brought against well drillers seeking recovery of damges for pollution alleged to rise of drilling operations. (Bradbeer-NWWA)
W76-00386

WILL TEXAS HAVE ENOUGH WATER FOR THE ELECTRIC UTILITY INDUSTRY,
Texas Water Development Board, Austin. Operations Div.
For primary bibliographic entry see Field 6D.
W76-00421

ANIMAL WASTE MANAGEMENT IN TEXAS: TESTIMONY PRESENTED TO THE SOLID WASTE STUDY COMMITTEE OF THE TEXAS HOUSE OF REPRESENTATIVES,
Texas Agricultural Extension Service, College Station.
J. M. Sweeten.
Memo AENG 6, 1972. 10 p.

Descriptors: *Farm wastes, *Texas, *Feed lots, *Cattle, Proteins, Recycling, Poultry, Water pollution, Dehydration, Fertilizers, Odor, Rates of application.
Identifiers: Land disposal, Building materials, Refeeding, Pyrolysis, Turkeys.

Beef feedlots account for 65 percent of the animal manure (dry weight basis) in Texas. Of the total tonnage, 70 percent is from lots which do not contribute to surface runoff under storms of less than once-in-25-years frequency. Other lots are being upgraded toward this goal. Land disposal provides fertilizer and soil conditioning benefits. No salt build-up occurs with application rates below 300-900 tons/acre. Land disposal of solid beef feedlot wastes at rates consistent with sound agronomic practice gives benefit-cost ratios of about 2:1 or 3:1. Other methods cited are conversion to a protein source by thermophilic bacteria (GE-Casa Grande, Arizona), conversion to building materials by mixing with glass and heating at atmospheric pressure to 300-400 degrees C and 3000-4000 psi, refeeding as a fermented mixture of manure and hay, and pyrolysis with ammonia recovery. Turkey feedlots contribute to water pollution. It is usual in Texas to move the pens rather than the manure, utilizing the fertilizer value of the manure where it falls. Caged layers produce a high-nitrogen waste. Dehydration and refeeding appear promising. A cautious approach to this solution is urged. Broiler manure has value as a fertilizer and in cattle feed rations. For dairy cattle and swine, liquid manure handling is usual. Odor problems arise. Lagooning provides little economic return. Slurry irrigation by pipeline and spray nozzle or by storage pit and honey wagon is recommended. (East Central Oklahoma State)
W76-00426

CONSEQUENCES OF WASTE DISPOSAL ON LAND,
Agricultural Research Service, St. Paul, Minn. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 5E.
W76-00427

ENVIRONMENTAL PROTECTION GUIDELINES FOR DAIRIES,
Texas Agricultural Extension Service, College Station.
J. M. Sweeten.
March 14, 1975, 15 p, 7 fig.

Descriptors: *Legal aspects, *Regulation, *Dairy industry, *Waste management, *Texas, Permits, *Water pollution control, Air pollution control, *Environmental control, Water quality standards.
Identifiers: Runoff control, Sanitation.

Proper site selection and facility design can minimize the water and air pollution from dairies. State and federal pollution control regulations greatly influence the design of dairy waste management systems. Such requirements for Texas dairies are given and explained. The major requirement for dairies to obtained permits from the Texas Water Quality Board is that systems be provided to prevent discharge from the premises. Generally, two systems are required: runoff control and manure management. Recommendations for these systems are given. Federal water pollution control regulations are also discussed. The Texas Air Control Board under the State Air Pollution Control Program has the authority to regulate odors from all dairies in the State under a general nuisance regulation. Permits and other regulations are required by the Texas Air Control Board and are explained. Dairy sanitation is under the Texas State Department of Health and milk inspection units of major Texas cities. Requirements for sanitation are listed. General Permit Procedures are discussed. (Kehl-East Central Oklahoma State)
W76-00428

AGRICULTURAL RESEARCH CONCENTRATES ON FARM WASTE.
New Scientist, Vol 59, No 856, p 198, July 26, 1973.

Descriptors: *Farm wastes, Effluents, *Slurries, *Waste treatment, *Regulation, Economics, Reclamation, Water pollution, Water quality standards, *Biochemical oxygen demand.
Identifiers: *Great Britain.

Scientists in Great Britain are using straw, hessian sacking, and even hedge-clippings, all of which are freely available in large quantities on most farms, in an effort to cut the cost of farm effluent treatment and achieve the Royal Commission standards of BOD for effluent charges. The aim has been to concentrate on the most extreme of farm slurry problems. Effluent from animals is one of the biggest problems farmers have to face. There is legislation to clamp down on farmers' methods of disposal if pollution of the water or the air infringes the regulations, but with few inspectors to check on what is happening in rivers and streams the low is often broken. In Silsoe they treat slurry by mechanical separation of the solids content from liquid for easier handling and aerobic treatment of the liquid to kill the smell. The process and costs involved are discussed in detail. (East Central Oklahoma State)
W76-00430

ANIMAL WASTE--REGULATORY CONSIDERATIONS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
L. R. Shuyler.
In: Control of Agriculture-related Pollution in the Great Plains, Seminar, Lincoln, Nebraska, July 24-25, 1972, p 91-95. 1 tab, 3 ref.

Descriptors: *Water pollution cont
*Regulation, *Feed lots, *Perm
Discharge(Water), *Farm wastes
Identifiers: *Environmental impact statemer
*Zero discharge

On December 23, 1970, President Nixon iss
Executive Order Number 11574 which directed
Army Corps of Engineers to issue discharge p
mits under the 1899 Rivers and Harbors Act
May 25, 1971, EPA administrator William
Ruckelshaus testified before the House Comm
tee on Agriculture to outline the permit progra
application to the confined feeding industry.
felt that the program should be limited to feedl
of 1000 or more animal units which discharge th
wastes from a single point source. Permit appli
tions were required to be filed by July 1, 1971
ruling handed down by Judge Aubrey Robins
Jr., ordered that environmental impact stateme
be filed for every permit issued. This rendered
permit program virtually useless due to the mo
mental manpower problem that the requirem
for impact statements created. The ruling m
eventually make more comprehensive and wor
ble enforcement of Federal and State water qua
standards a reality, however, The judgement a
expanded the definition of 'non-navigal
streams to include streams large enough
recreational boating. Legislation now pending
Congress, in addition to providing funds for m
needed expansion of research, development, a
demonstration in agricultural pollution cont
stipulates the national goal of 'zero discharge'
1985, and provides for clarification of the natio
permit program to be administered by the E
(Battles-East Central Oklahoma State)
W76-00436

**A SYSTEMS APPROACH TO CATT
FEEDLOT POLLUTION CONTROL,**
Texas Tech Univ., Lubbock. Dept. of Chem
Engineering.
G. F. Meenaghan, D. M. Wells, and E. A. Coleman.
Presented at the 72nd National Meeting, Ameri
Institute of Chemical Engineers, St. Louis, M
souri, May 21-24, 1972, 29 p. 24 fig, 5 tab.

Descriptors: *Cattle, *Feed lots, *Water pollut
control, Air pollution, Fertilizers, Waste dispo
Irrigation, Chemical properties, *Systems an
sis, Farm wastes.
Identifiers: Slotted floors, Soil injection, L
disposal.

Very simple and relatively low-cost solutions
available for the problem of water pollut
caused by cattle feedlots. Vastly more comp
and difficult problems to solve are the air pollut
and solid waste disposal problems resulting fr
conventional feedlot operations. Farmers do
generally consider it to be economically feasibl
use manure as fertilizer. Hence, about the only
tion open to most feedlot operators for disposa
solid waste is to provide a large tract of land
which the waste can be stored more or less
definitely...Veritable mountains of man
exist...these mountains are frequently ignited
spontaneous combustion, thereby providing an
ditional significant source of air pollution.
nearly, ideal feedlog, that of the Green Valley C
tle Company at San Marcos, Texas, is descrit
It has slotted floors over pits cleaned daily
completely roofed, and provides for irrigation
means of a 2000-gal capacity honeywa
equipped with chisels which dispose of the man
below surface thus avoiding the otherwise inev
ble odor and fly problems. (East Cen
Oklahoma State)
W76-00446

**COMMERCIAL FEEDLOTS-NUISANCE, ZO
ING AND REGULATION,**
D. J. Paulsen.
Washburn Law Journal, Vol 6, p 493-507, 1967
ref.

Descriptors: *Farm wastes, *Feed lots, *Nuisance, *Zoning, *Regulation, Commercial, Agriculture, Air pollution, Water pollution control, Pests, Odor, Abatement, Livestock, Legal aspects.
Identifiers: Noise, Injunction.

Livestock feedlots are not public nuisances per se, but they may become nuisances by virtue of their operation or the manner in which they are kept. Each case must of necessity be decided by examination of all the facts and circumstances surrounding the particular alleged nuisance. Among the facts and circumstances to be considered are: the type of neighborhood, the nature of the complaint, the proximity of those alleging the injury, and nuisance frequency. The remedies for nuisance are damages at law and injunction or abatement in equity. Zoning and regulation by public agencies are methods used to control the location and operation of feedlots, but because most zoning laws and regulations are the product af agrarian oriented legislatures, feedlots have been exempted to a certain degree from zoning and regulation by statue. A trend is starting in the East, however, to consider commercial feedlots (As opposed to the usual farm feedlots) as being more in the nature of an industry. This impetus is expected to spread. (Ballard-East Central Oklahoma State)
W76-00449

STATE REGULATIONS PERTAINING TO LIVESTOCK FEEDLOTS,
Agricultural Research Service, Beltsville, Md. Agricultural Engineering Research Div.
W. F. Schwiesow.
Presented at 1971 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 7-10, 1971, Paper No. 71-919, 16 p.

Descriptors: *Regulations, *Feed lots, *Livestock, *Water pollution control, *Farm wastes, Water quality standards.

The need for water pollution regulation led to the establishment of water quality standards through the Water Quality Act of 1965. Through some rather unusual channels, the need to include the livestock feedlot industry became apparent. Investigations on fish kills and polluted streams established that feedlots and dairy farms were a major cause. A focus on livestock wastes as a pollution source drew attention to the need for changes in agricultural practices. This brought about livestock feedlots now being subject to water quality control regulations. Need for uniformity in these regulations is recognized and various reasons are given. A listing of state offices that may be contacted for additional information on such regulation is provided. (Kehl-East Central Oklahoma State)
W76-00451

COSTS OF CONTROLLING FEEDLOT SURFACE RUNOFF,
Utah State Univ., Logan. Dept. of Agricultural Economics.
D. B. Nielsen, and P. P. Olson.
Utah Farmer-Stockman, Vol 92, p 10-11, October 5, 1972. 1 fig.

Descriptors: *Feedlots, *Agricultural runoff, *Costs, *Utah, Runoff control, Pollution abatement, Government supports, Water pollution control.

Of the 31 feedlots in Utah capable of handling 1000 head or more, 26 were assessed in a study of runoff potential. It appears that an expense of 18 cents per head fed would be involved in correcting runoff conditions. Of the lots, 12 had no runoff problem, 6 needed minor improvements, 5 needed major improvements, and 3 would find it more economical to relocate. (East Central Oklahoma State)
W76-00458

NUISANCE LAWSUITS--NEIGHBOR VS. NEIGHBOR.
Succesful Farming, Vol 72, No 10, p 40, September, 1974.

Descriptors: *Legal aspects, *Waste treatment, *Waste disposal, Locating, Nuisance(Water law), Pollution abatement.
Identifiers: Bower vs. Hog Builders, Inc.

Even if a livestock operation is not large enough for a permit to be required, the operation can still get into trouble concerning animal waste disposal. If a nuisance (the use of land by one that unreasonably interferes with the enjoyment or use of another's land) is created, a nuisance lawsuit may be brought against the operator. An example of this is the Bower vs. Hog Builders, Inc. case. In this instance, the Hog Builders, Inc. began a swine breeding and feeding operation adjoining the Bower Farm fifteen years after the Bowers had established their farm. This swine operation allowed effluent to flow onto the Bower's farm causing fish kills, odor, a difference in drinking water, and an influx of rats and flies. The Bowers lawsuit was submitted to a jury, and the Bowers were awarded $46,200 actual damages and $90,000 punitive damages. Such lawsuits can be avoided by locating such operations away from others' homes, by proper zoning, through licensing laws, and through construction of adequate waste treatment facilities. (Merryman-East Central)
W76-00460

TEST WAYS TO REDUCE FEEDLOT POLLUTION.
Wallaces Farmer, Vol 97, No 8, p 50, April 1972.

Descriptors: *Feed lots, *Water pollution, *Groundwater, *Agricultural runoff, Slopes, Management, *Sampling, Basins, *Nebraska, Engineering, Caissons, Waste treatment.
Identifiers: *Sloping feed lots.

Management systems designed to limit runoff, handling manure, and consequently pollution of streams and ground water have been constructed and are under observation. These are new concepts of inexpensive runoff control from sloping feedlots. Cattle feedlots on slopes as high as 15% may become minimum polluters through the use of engineering and management. A feedlot near Omaha, Nebraska (On a steep 15% slope with one 350-ft contributing slope length above the lone basin) and another near Springfield, Nebraska (With 3 basins on a 6% slope, with contributing slope length of about 120 ft each) were studied. Soil manure materials carried with the runoff were deposited in basins. Basins provided opportunity for the settling of suspended solids. Water from the ponds was used to irrigate nearby croplands. Runoff-recording equipment and ground water sampling wells were installed on both lots. At Springfield, none of the ground water samples have exceeded 10 parts per million of nitrate-nitrogen, a figure the Public Health Service has set as minimum desirable limit in drinking water. (Cameron-East Central Oklahoma State)
W76-00461

BRAKING FEEDLOT RUNOFF.
Agricultural Research, Vol 19, No 2, p 5, February, 1971. 1 fig.

Descriptors: *Runoff control, *Feed lots, *Nebraska, Water pollution control, Groundwater, Sampling, Soil analysis.
Identifiers: Soil cores.

Two management systems that limit pollution of streams and groundwater from beef cattle feedlots are currently under development in Nebraska. Collection basins are utilized to trap the runoff. Runoff recording equipment and groundwater sampling wells have been installed at two test feedlots. At one feedlot, steel cased wells (Caissons) have been installed to a depth of 12 ft to allow a study of soil gases and pollutants moving downward under various conditions in the feedlot. Soil cores have been and are being taken for analysis. (East Central Oklahoma State)
W76-00462

ECONOMIC IMPACT OF SELECTED POLLUTION CONTROL MEASURES ON BEEF AND DAIRY FARMS,
Economic Research Service, Washington, D.C.
J. B. Johnson.
Agricultural Waste Conference Emphasis-Animal Waste, Kellogg Center, Michigan State University, East Lansing, May 22-23, 1974, p 31-43. 7 tab.

Descriptors: *Water pollution, *Regulation, *Permits, *Costs, Agricultural runoff, Feedlots, Dairy industry, *Michigan, *Water quality standards.
Identifiers: *Effluent guidelines, Land disposal.

The Environmental Protection Agency point source effluent guidelines are described in detail as they pertain to beef and dairy operations. Even the smaller dairy and beef feedlots (Under 1,000 animal unit capacity) may be expected to comply with effluent guidelines established by water pollution control agencies. Michigan and other states will have state administered, federally approved permit programs for point source dischargesrs. Feedlots and dairy farms with surface water control problems will receive permits for continued operation contingent on a specified time for taking corrective measures. The application of these effluent guidelines will have differential effects on capital outlay requirements and production costs, depending upon feedlot capacity or dairy herd size and the type of housing in use. (Cartmell-East Central Oklahoma State)
W76-00470

MICHIGAN'S ENVIRONMENTAL CONTROL PROGRAM AND ORGANIZATION,
Michigan Dept. of Natural Resources, Lansing. Environmental Protection Services.
R. W. Purdy.
Agricultural Waste Conference Emphasis-Animal Waste, Kellogg Center, Michigan State University, East Lansing, May 22-23, 1974, p 45-50. 1 fig.

Descriptors: *Michigan, *Water pollution control, *Air pollution, Eutrophication, Organizations, Environmental control.

Data on Michigan streams shows that a large majority are not experiencing water quality problems. Approximately 85 stream segments have known or suspected water quality problems from point source discharges. About half of the state's lakes may be experiencing eutrophication. This is a natural aging process which can be accelerated by man's activities. Michigan estimates about one third of its lakes to be over-fertilized from unnatural sources. In general, it was concluded, the water resources of Michigan are in good condition. The air pollution problem in the areas other than highly populated metropolitan centers are basically caused by emissions of air contaminants from industrial operations. The major contaminants for which there is concern are sulfur dioxide and suspended particulate matter. (Cartmell-East Central Oklahoma State)
W76-00471

POLLUTION ABATEMENT ON FARMSTEADS,
Agricultural Stabilization and Conservation Service, Washington, D.C.
R. Locher.
In: Agricultural Waste Conference Emphasis-Animal Waste, Kellogg Center, Michigan State University, East Lansing, May 22-23, 1974, p 71.

Descriptors: *Pollution abatement, *Costs *Farms, *Government finance, *Cost sharing, Water pollution control, Farm wastes.

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The Federal Government shares the cost with farmers under the 1974 Rural Environmental Conservation Program and the 1973 Rural Environmental Assistance Program for carrying out pollution abatement practices on farmland. Both conservation programs are available to farmland owners throughout the 1974 year. Requests for cost- sharing must be filed and approved by the local county ASC committee before the practice is started. (Cartmell-East Central Oklahoma State)
W76-00474

EFFECT OF NUTRIENT INPUT REDUCTION ON THE EUTROPHICATION OF THE MADISON LAKES.
Wisconsin Univ., Madison.
W. C. Sonzogni.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No 75-5960. PhD Thesis, 1974, 420 p.

Descriptors: *Nutrients, *Lakes, *Phosphorus, Sewage disposal, Models studies, Effluents, Runoff, Wisconsin, *Eutrophication, Water pollution control.
Identifiers: Madison(Wisc).

Nutrient loadings have been estimated for each of the Madison (Wisconsin) lakes. It has been seen from current and historical data that phosphorus concentrations are reduced when sewage effluent is diverted from entering the lakes. This indicates that external inputs, rather than lake sediments, are the controlling factors in phosphate concentration. Sewage diversion around Lake Mendota in 1971 reduced the average annual phosphorus loading by about 20 percent. However, observation over a three year period showed that the effect of this diversion was obscured by yearly variations in loadings from other sources, such as runoff. Phosphorus accumulation rates per unit area of anoxic sediment in Lake Mendota were shown to be similar to rates for other eutrophic lakes. Linear models to predict the rate and extent of recovery of a lake following phosphorus input reduction were evaluated. A phosphorus residence time model may be used to predict the steady-state mean phosphorus content of the lake which will be reduced in direct proportion to the change in input. It was concluded that non-conclusive evidence exists for the increases in phosphorus levels in Lake Mendota. (Prague-FIRL)
W76-00500

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

INTERDISCIPLINARY ASPECTS OF WATER RESOURCES PLANNING AND MANAGEMENT,
American Waterways Operators, Inc., Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-00061

PANEL ON DISCIPLINE VIEWPOINTS AND POSITIONS: SOCIO-ECONOMICS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6B.
W76-00062

PANEL ON DISCIPLINE VIEWPOINTS AND POSITIONS: POLITICAL SCIENCE AND LAW,
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W76-00063

PANEL ON DISCIPLINE VIEWPOINTS AND POSITIONS: ECOLOGY,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 6G.
W76-00064

INTERDISCIPLINARY STUDIES OF LARGE RESERVOIRS IN AFRICA,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 4A.
W76-00065

DISCUSSION (OF, 'INTERDISCIPLINARY STUDIES OF LARGE RESERVOIRS IN AFRICA,' BY G. F. WHITE),
Engineering-Science, Inc., Cincinnati, Ohio.
For primary bibliographic entry see Field 4A.
W76-00066

INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS OF THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 2H.
W76-00067

DISCUSSION (OF, 'INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS OF THE GREAT LAKES' BY L. T. CROOK),
State Univ. of New York at Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2H.
W76-00068

DISCUSSION (OF, 'INTERDISCIPLINARY MODELING OF LIMNOLOGICAL ASPECTS OF THE GREAT LAKES,' BY L.T. CROOK),
Resource Management Associates, Lafayette, Calif.
For primary bibliographic entry see Field 2H.
W76-00069

INTERDISCIPLINARY APPROACH TO GEOTHERMAL DEVELOPMENT,
Bureau of Reclamation, Boulder City, Nev. Regions.
For primary bibliographic entry see Field 4B.
W76-00070

DISCUSSION (OF, 'INTERDISCIPLINARY APPROACH TO GEOTHERMAL DEVELOPMENT,' BY M. K. FULCHER),
California Univ., Los Angeles.
For primary bibliographic entry see Field 4B.
W76-00071

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY,
Corps of Engineers, New York. North Atlantic Div.
For primary bibliographic entry see Field 6B.
W76-00072

DISCUSSION (OF, 'NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY,' BY H. E. SCHWARZ, ET AL.),
Bureau of Outdoor Recreation, Philadelphia, Pa. Northeast Regional Office.
For primary bibliographic entry see Field 6B.
W76-00073

CORPS URBAN PLANNING IN ST. LOUIS-MALINE CREEK: AN INTERDISCIPLINARY EFFORT,
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 3D.
W76-00074

DISCUSSION (OF, 'CORPS URBAN PLANNIN IN ST. LOUIS-MALINE CREEK: AN INTE DISCIPLINARY EFFORT,' BY E.D. RAHUBK ET AL.),
Corps of Engineers, San Francisco, Calif. Sou Pacific Div.
For primary bibliographic entry see Field 3D.
W76-00075

DISCUSSION (OF, 'CORPS URBAN PLANNIN IN ST. LOUIS-MALINE CREEK: AN INTE DISCIPLINARY EFFORT,' BY E.D. RAHUBK ET AL.),
Idaho Univ., Moscow.
For primary bibliographic entry see Field 3D.
W76-00076

AN ASSESSMENT OF UNIVERSITY INTE DISCIPLINARY RESEARCH: THE WISCONS RIVER AND THE LOWER FRASER RIVE WATER QUALITY STUDIES,
British Columbia Univ., Vancouver. Westwat Research Centre.
For primary bibliographic entry see Field 5G.
W76-00077

DISCUSSION (OF, 'AN ASSESSMENT UNIVERSITY INTERDISCIPLINAR RESEARCH: THE WISCONSIN RIVER AN THE LOWER FRASER RIVER WATER QUAL TY STUDIES,' BY A. H. J. DORCEY AND L FOX),
Colorado Univ., Boulder. Inst. of Behavio Science.
For primary bibliographic entry see Field 5G.
W76-00078

PANEL ON DISCIPLINE SUMMARIES AN OUTLOOKS: INTERDISCIPLINAR PLANNING AND USE OF THE SYSTEMS CO CEPT IN PLANNING,
H. O. Banks.
In: Proceedings of the Conference on Interdiscip nary Analysis of Water Resource Syste University of Colorado, Boulder, June 19-2 1973. An American Society of Civil Enginee Research Activity, ASCE Project No 201.07/1 3.72-4, New York, NY, p 380-387, 1975.

Descriptors: *Water resources developme *Systems analysis, *Planning, Mathemati models, Governments, Coordination, Alternati planning, Comprehensive planning.
Identifiers: *Interdisciplinary plannir *Multiobjective planning.

A discussion is presented of interdisciplina planning and the use of systems analysis planning as related to the Conference on Int disciplinary Analysis of Water Resource Systen The Conference omitted consideration of int disciplinary planning and research by states a lower levels of government. Basically, int disciplinary planning should utilize the expert of the range of disciplines necessary to fully co sider all significant aspects of a given proble Throughout the real-world planning process, the must be continued interaction without compa mentalization among the disciplines, acting in co cert to achieve defined objectives. At the ve beginning, problems should be defined on an int disciplinary basis and possible alternati delineated. Systems analysis and modeling a considered tools of planning. The planner m define the problem, select the alternatives to evaluated, and formulate questions to be posed the systems analyst who will assist him. In or for future interdisciplinary planning to become reality at all levels of government, and in priva enterprise, more people must be trained in a convinced of the necessity for the approach. T social and natural sciences must be motivated become involved. Consideration of and reco mendations for necessary legal and institutio

nges are essential. Finally, future conferences uld consider resource management planning, ause water plans must be a part of an in- rated whole. (See also W76-00060) (Bell-Cor- l)
6-00079

NEL ON DISCIPLINE SUMMARIES AND TLOOKS,
ois Univ. at Chicago Circle. Coll. of Engineer- .
Bugliarello.
Proceedings of the Conference on Interdisciplin- y Analysis of Water Resource Systems, iversity of Colorado, Boulder, June 19-22, 3. An American Society of Civil Engineers search Activity, ASCE Project No 201.07/17- 2-4, New York, NY, p 368-379, 1975.

scriptors: *Water resources development, anning, Water policy, Behavior, Social aspects. ntifiers: *Interdisciplinary planning, Mul- sciplinary.

day's engineer may no longer be the central ire in planning. The Colorado conference has vided a deeper understanding of the nature of erdisciplinary problems in water resources. ecifically, we have made a number of important ievements: (1) a clearer perception of the sub- but meaningful difference between mul- sciplinary and interdisciplinary; (2) emphasis of evaluative core of the policy-making process; emergence of a remarkably honest insight into sociology and the behavioral aspects of group namics in interdisciplinary teams; and (4) exam- s of the actual achievements of interdisciplina- teams. Besides achievements made possible by erdiscplinary approaches, we have seen some the problems, i.e., in evaluation, team continui- and pressure on team members. In answering question of where we go from here, three jor issues must be stressed: (1) values; (2) the ure of planning; and (3) the distinction between erdisciplinary and interagency planning. These discussed, and several other miscellaneous is- s are considered, including the fundamental thodologies from each discipline, effective in- action between disciplines, and the genesis of erdisciplinary fusion. (See also W76-00060) ell-Cornell)
6-00060

OBLEMS IN INTEGRATING WATER PRO- AMS,
vironmental Protection Agency, Washington, C. Office of Water Programs.
r primary bibliographic entry see Field 5G.
6-00082

VERNMENTAL CONTROL OF LAND USE ARIZONA (PRELIMINARY DRAFT),
zona Environmental Planning Commission; l Arizona House of Representatives, Phoenix. Everett.
port to the Arizona Environmental Planning mmission, May, 1974. 306 p, 6 fig, 4 tab, 20 ref.

scriptors: *Land use, *Land development, ood plain zoning, *Water conservation, rizona, Land management, Flood control, Ir- ation districts, Drainage districts, Cities, deral Government, State Governments, En- onmental control, Municipal water, Air pollu- n, Planning, Zoning, Urbanization, Land ources.

s report identifies those government agencies all levels which have an impact on land uses, h public and private, in Arizona. Although deral agencies are discussed, emphasis is placed cities, counties, and state authorities. This re- t is intended to be a research document to ist the Arizona Environmental Planning Com- sion in preparing recommended legislation for the Arizona State Legislature. An analysis is made of the statutory authority various agencies possess over the many land uses. Included are sections covering floodplain management and floodplain zoning at the city and county levels. In addition, statutes are presented which govern irrigation, drainage, flood control, irrigation water delivery, multi-county water conservation, and other special state-wide districts. A brief survey of existing and proposed land use programs for other states is added. (Robinett-Arizona)
W76-00183

6B. Evaluation Process

INTERDISCIPLINARY ASPECTS OF WATER RESOURCES PLANNING AND MANAGEMENT,
American Waterways Operators, Inc., Washington, D.C.
J. R. Smith.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, June 19-22, 1973, University of Colorado, Boulder. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 1-22, 1975.

Descriptors: *Water resources development, *United States, *Economics, *Transportation, Industries, *National Water Commission, Water policy, Planning, Management, Governments, Benefits, Inland waterways, Flood control, Multiple-purpose, Evaluation.
Identifiers: User charges.

The final report of the National Water Commission, recently issued to Congress and the President, is judged herein to be a 'blueprint for the destruction' of our Nation's water resources program. Although the report contains good suggestions, it is feared that adoption of many of its recommendations would cause a drastic change in programs already proven successful, such as flood control; thriving programs such as inland water transportation would be overhauled, causing dangerous repercussions in industry and commerce. The basic assumption of the Commission's report is that water resources programs no longer serve valid national needs, the only benefits being economic benefits on the local level; therefore, the cost of providing these local benefits should be recouped by imposing charges upon local user entities whose benefits are immediate and direct, rather than upon taxpayers of the Nation whose benefits seem more remote and indirect. Discussed are recommendations concerning the transportation industry, i.e., the imposition of user charges on all carriers utilizing Federal waterways. Considered are the detrimental effects of these narrow-in-scope recommendations on local communities, on the movement of particular commodities, on regional economies, on the price of goods and services, and on employment. The author opts for the continuation of a sound water management approach to serve the needs of the public and industry, for which an extremely high degree of cooperation among the involved disciplines is essential. (See also W76-00060) (Bell-Cornell)
W76-00061

PANEL ON DISCIPLINE VIEWPOINTS AND POSITIONS: SOCIO-ECONOMICS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
E. L. David.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 23-40, 1975.

Descriptors: *Economics, *Water resources, *Planning, *Management, *Universities, Constraints, Resource allocation, Social aspects, Decision making, Mathematical models, Systems analysis.
Identifiers: *Interdisciplinary research, *Socio-economics, Opportunity costs, Non-market decisions, Public finance.

Economists are involved in water resources planning and management. An overview is given of the traditional interests of the economics profession, including a brief history of some economic thought appropriate to management problems. Then a more specific examination is made of the role of the economist in interdisciplinary research; considered is the importance of appropriate forms of organization in facilitating interdisciplinary research in universities. The most important and difficult decisions in water resources planning and management are non-market, primarily public finance, decisions. Economists have made progress in conceptualizing these problems, have been acutely aware of the trade-offs involved in all resource allocations, and have realized that the incidence of costs and benefits of non-market goods and services is open to subjective judgment. However, economists have failed to accept a number of challenges. They have been: spending too little time on problems of the open economy; ignoring the contributions of related social disciplines; failing to generate appropriate models and data to tackle relevant problems; and paying attention to general rather than partial theory. Economists do not work effectively enough on real-world problems due to a lack of experimentation and limited scale of research. Interdisciplinary research prospects and limitations in the university are considered. Overall, academic institutions possess the potential for exceedingly powerful research. The challenge is to re-orient the academic profession and the university organizational structure to facilitate this research. (See also W76-00060) (Bell-Cornell)
W76-00062

DISCUSSION (OF, 'INTERDISCIPLINARY APPROACH TO GEOTHERMAL DEVELOPMENT,' BY M. K. FULCHER),
California Univ., Los Angeles.
For primary bibliographic entry see Field 4B.
W76-00071

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY,
Corps of Engineers, New York. North Atlantic Div.
H. E. Schwarz, D. C. Major, and J. E. Frost, Jr.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 245-271, 1975. 10 ref.

Descriptors: *Water resources development, *Alternative planning, *Comprehensive planning, *Regions, *Social aspects, Management, Demand, Supply, Mathematical models, Economics, Regional analysis, Decision making, Methodology, Land resources, Cost-benefit analysis, Systems analysis, Optimization.
Identifiers: *Interdisciplinary analysis, *North Atlantic study, *Multiple-objective planning, Cost minimization.

The experiences of the authors are described during their participation in the North Atlantic Regional Water Resources Study (NAR), an interdisciplinary, multiple-objective planning effort. Discussed are the nature of the study and the techniques used. The NAR Study was a comprehensive, long-range planning effort to procure and document information for use by decision makers to guide the development of the Region's water and related land resources. A new procedure--multiple-objective planning--was introduced. Three objectives, and preliminary cor-

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responding programs, were chosen by the Coordinating Committeel-National Income, Environmental Quality, and Regional Development. Included among the techniques adopted were computerized demand and supply models, data accounting systems, and decision making procedures for choosing among alternatives. Multiple-objective planning for water resources, a generalization of the tradiational benefit-cost analysis, considers not only management and development alternatives, but also prevailing social preferences toward objectives. The presence of many disciplines together with new planning techniques appeared to increase the quality of the NAR Study products and the behavior skills and contributions of the participants. A water study should be interdisciplinary and organized so that the disciplines are arranged on a broad plane of equality in influencing the study. (See also W76-00060) (Bell-Cornell)
W76-00072

DISCUSSION (OF, 'NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY,' BY H. E. SCHWARZ, ET AL.),
Bureau of Outdoor Recreation, Philadelphia, Pa. Northeast Regional Office.
J. D. Peine.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 272-280, 1975.

Descriptors: *Water resources development, *Long-term planning, Resource allocation, Constraints, Social aspects, Coordination.
Identifiers: *North Atlantic Study, *Multiple-objective planning, *Interdisciplinary analysis.

The North Atlantic Regional Water Resources Study is criticized and suggestions are made to improve the interdisciplinary water resources planning process. The NAR Study was a constructive step toward genuine interdisciplinary water resource planning. The techniques of the multiple-objective planning approach should be used as building blocks for future water planning. This multi-objective framework is not being used in two Level B Water Resources Council-administered studies in the North Atlantic Region. The state-of-the-art of interdisciplinary water resource planning fosters a lack of coordination between studies, and unfortunately, an attempt is made in these Level B investigations to found predictions of resource allocations on a data base which is not uniformly quantitative, comparative, or cohesive. In order for a framework study to provide effective guidelines for long-term planning, there must be a stronger tie than was evidenced in the NAR Study between accurate data projecting future social needs and accurate data defining future resource constraints. Otherwise, deriving efficient national income, regional development, and environmental quality planning alternatives for, say, the year 2000 can only be guesswork. Discipline and agency bias must be compensated for through control of the study and coordination of the participants. The plan formulation process should be initiated at the beginning of the study, not delayed until all the inventory data is gathered. Finally, more comments are given concerning: funding; leadership; agency appendices to the main study report; and plan implementation. (See also W76-00060) (Bell-Cornell)
W76-00073

CORPS URBAN PLANNING IN ST. LOUIS-MALINE CREEK: AN INTERDISCIPLINARY EFFORT,
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 3D.
W76-00074

DISCUSSION (OF, 'CORPS URBAN PLANNING IN ST. LOUIS-MALINE CREEK: AN INTERDISCIPLINARY EFFORT,' BY E.D. RAHUBKA, ET AL.),
Corps of Engineers, San Francisco, Calif. South Pacific Div.
For primary bibliographic entry see Field 3D.
W76-00075

DISCUSSION (OF, 'CORPS URBAN PLANNING IN ST. LOUIS-MALINE CREEK: AN INTERDISCIPLINARY EFFORT,' BY E.D. RAHUBKA, ET AL.),
Idaho Univ., Moscow.
For primary bibliographic entry see Field 3D.
W76-00076

PANEL ON DISCIPLINE SUMMARIES AND OUTLOOKS: INTERDISCIPLINARY PLANNING AND USE OF THE SYSTEMS CONCEPT IN PLANNING,
For primary bibliographic entry see Field 6A.
W76-00079

PANEL ON DISCIPLINE SUMMARIES AND OUTLOOKS,
Illinois Univ. at Chicago Circle. Coll. of Engineering.
For primary bibliographic entry see Field 6A.
W76-00080

PROBLEMS IN INTEGRATING WATER PROGRAMS,
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 5G.
W76-00082

IMPLEMENTATION OF INTERSTATE WATER QUALITY PLAN,
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 5G.
W76-00083

WATER RESOURCES DEVELOPMENT BY THE U. S. ARMY CORPS OF ENGINEERS IN NEVADA: 1975.
For primary bibliographic entry see Field 5G.
W76-00184

WATER RESOURCES DEVELOPMENT BY THE U. S. ARMY CORPS OF ENGINEERS IN ARIZONA: 1975.
For primary bibliographic entry see Field 5G.
W76-00185

WATER RESOURCES DEVELOPMENT BY THE U. S. ARMY CORPS OF ENGINEERS IN UTAH: 1975.
For primary bibliographic entry see Field 5G.
W76-00186

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ., Tucson. Div. of Economic and Business Research.
H. J. Frank.
Arizona State Fuel and Energy Office, Phoenix, February, 1975. 114 p, 10 fig, 41 tab, 17 ref, 5 append.

Descriptors: *Arizona, *Hydroelectric plants, *Electric power, *Fossil fuels, *Future planning(Projected), Hydroelectric power, Powerplants, Electric powerplants, Electric power production, Electric power demand, Electric power industry, Thermal powerplants, Natural gas, Oil, *Energy, Planning.
Identifiers: Energy supply, Solar energy.

The contribution which Arizona's ene resources currently make toward meeting energy requirements of the state is limited hydroelectric power and coal. The largest hydropower generated from 51 units at 12 sit Known deposits of crude oil, natural gas a uranium are small and information on th sources is inadequate. Over 85 percent of t supplies consist of natural gas and petrole products, virtually all shipped in from neighbor states. Energy demand projections indicate t consumption in 1985 could be as much as 2 times the 1973 level if the historical growth tr continues. The major problem area will be the c tinuing decline in natural gas supplies, which is likely to be halted before 1980. To supplement natural gas shortage, Arizona should consider burning of coal in large industrial installatio support of gasification of coal and importation gas, construction of a major oil refinery in state, intensive exploration of possible geother sources, accelerated development of solar ene and energy conservation. (Robinett-Arizona)
W76-00196

EVALUATION AND IMPLEMENTATION URBAN DRAINAGE PROJECTS,
Colorado State Univ., Fort Collins. Dept. of C Engineering.
For primary bibliographic entry see Field 4A.
W76-00201

OUTDOOR RECREATION IN THE SA VERDE BASIN OF CENTRAL ARIZONA: MAND AND VALUE,
Arizona Univ., Tucson. Dept. of Agricult Economics.
W. J. Sublette, and W. E. Martin.
University of Arizona, Agricultural Experi Station, Technical Bulletin 218, June, 1975. 46 fig, 31 tab, 26 ref, 2 append.

Descriptors: *Recreation, *Forest managem *Recreation demand, *Social values, *Mone benefits, Water sports, Economics, Land Multiple-purpose projects, Recreation facili Social aspects, Transportation, Water utiliza Social participation, Lakes, *Arizona, Va Evluation, Demand, Costs.
Identifiers: Salt River(Ariz), Verde River(A Salt-Verde Basin(Ariz), Central Arizona.

Demand functions and value estimates representatives sites in the Salt-Verde basi well as values for the entire basin are presente mail survey was conducted to determine variable household expenditures incurred v visiting selected representive sites as a measu gross economic activity. The largest portion o penditures was incurred for transportation, ing from 37 percent at Luna Lake to 53 perce Brushy Basin-Four Peaks. Higher net values larger expenditures are associated with sites have water-based recreation, conside development at the sites, and fairly easy ac The nondiscriminating monopolist value estim for the sites in the entire Salt-Verde bas $36,376,487 and the consumer surplus value is mated at $78,438,193. (Robinett-Arizona)
W76-00382

COST OF PRODUCING CROPS IN THE RIGATED SOUTHWEST: PART III - NEVA
Aricona Univ., Tucson. Dept. of Agricu Economics.
For primary bibliographic entry see Field 3F.
W76-00383

MANAGEMENT OF UNDERGROUND WA RESOURCES,
University Coll., London (England).
For primary bibliographic entry see Field 3B.
W76-00418

ANNING A MUST FOR GROUNDWATER VELOPMENT,
fa (John J.), Fort Lee, N.J.
primary bibliographic entry see Field 4B.
6-00422

. Cost Allocation, Cost Sharing, Pricing/Repayment

STEWATER TREATMENT DESIGN: ONOMICS AND TECHNIQUES, PART I,
derbilt Univ., Nashville, Tenn.
primary bibliographic entry see Field 5D.
5-00224

ECONOMIC ANALYSIS OF THE PAT-RNS AND TRENDS OF WATER CONSUMP-N WITHIN THE SERVICE AREAS OF THE NOLULU BOARD OF WATER SUPPLY,
vaii Univ., Honolulu. Water Resources earch Center.
primary bibliographic entry see Field 6D.
5-00275

CREATES NEW SEWER AND PLANT IN-XES.
primary bibliographic entry see Field 5D.
5-00358

ST OF PRODUCING CROPS IN THE IR-ATED SOUTHWEST: PART III - NEVADA,
ona Univ., Tucson. Dept. of Agricultural nomics.
primary bibliographic entry see Field 3F.
5-00383

RROSION CONTROL--JUST ANOTHER ST.
rosion Engineering, St. Albert, (Alberta).
primary bibliographic entry see Field 8G.
5-00407

TS OF CONTROLLING FEEDLOT SUR-E RUNOFF,
State Univ., Logan. Dept. of Agricultural nomics.
primary bibliographic entry see Field 5G.
-00458

NOMIC IMPACT OF SELECTED POLLU-N CONTROL MEASURES ON BEEF AND RY FARMS,
nomic Research Service, Washington, D.C.
primary bibliographic entry see Field 5G.
-00470

LUTION ABATEMENT ON FARMSTEADS,
cultural Stabilization and Conservation Ser-Washington, D.C.
primary bibliographic entry see Field 5G.
-00474

NOMICS OF MANURE HANDLING,
sylvania State Univ., University Park. Dept. gricultural Economics.
primary bibliographic entry see Field 5D.
-00479

ECONOMICS OF RECYCLING CON-TED POULTRY WASTE THROUGH CAT-
sylvania State Univ., University Park. Dept. imal Science.
primary bibliographic entry see Field 5D.
-00481

6D. Water Demand

WATER FOR WYOMING'S COAL,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 3B.
W76-00090

THE HIGH PLAINS: PROBLEMS OF SEMIARID ENVIRONMENTS.
American Association for the Advancement of Science, Southwestern and Rocky Mountain Division, Committee on Desert and Arid Zones Research Symposium, Contribution 15, April 26-29, 1972, D. D. MacPhail, ed., Fort Collins, Colorado, 100 p. (1972)

Descriptors: *Semiarid climates, *Meteorology, *Groundwater resources, Wyoming, Nebraska, Colorado, Kansas, Texas, Wind velocity, Wind pressure, Weather modification, Cloud seeding, Droughts, Legal aspects, Water policy, Water utilization, Competing uses, Prior appropriation.
Identifiers: *High plains region, Plains.

A collection of papers presented at the American Association for the Advancement of Science, Committee on Desert and Arid Zones Research Symposium on the environments of the high plains. Major areas of discussion include a general overview of the high plains region, particularly in terms of future development and climatic problems. Weather phenomena and possible adjustments to weather problems of the region are discussed. Ground water sources, management, and diversion comprise another section. Land use problems, including predator control, effect of feed lots on the local environment, and waste recycling techniques are surveyed. A final section analyzes the alternative approaches to problems the region is now facing or will eventually face. (See also W76-00180 thru W76-00182) (Frondorf-Arizona)
W76-00179

LEGAL PROBLEMS AND SOLUTIONS TO SURFACE-GROUND-WATER MANAGEMENT,
Colorado State Univ. Fort Collins. Dept. of Economics.
G. E. Radosevich, and W. M. Sutton.
In: The High Plains. Problems of Semiarid Environments, Colorado State University, Fort Collins, p 32-41, (1972) 8 ref.

Descriptors: *Water management(Applied), *Prior appropriation, *Water law, *Water rights, *Conjunctive use, Semiarid climates, Groundwater resources, Colorado, Texas, New Mexico, California, Legal aspects, Water policy, Water utilization, Competing uses, Water resources, Water allocation(Policy), Surface-groundwater relationships, Legislation.
Identifiers: *New Mexico groundwater law, *Colorado water law.

The systems discussed concern legal schemes developed by Colorado and New Mexico for the purpose of administering to the conjunctive use problem along with a cursory examination of situations in Texas and California. The doctrine of prior appropriation is discussed in relation to its initial development in the western states for the purpose of controlling the appropriation of surface water to its evolution and modification to control the conjunctive use of ground and surface water. Western states are finally recognizing the intimate hydraulic connections of ground and surface water and the need to integrate their use with the one constant being the goal of maximum utilization. (See also W76-00179) (Robinett-Arizona)
W76-00180

TRANSMOUNTAIN WATER DIVERSION FOR THE HIGH PLAINS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
N. A. Evans.
The High Plains: Problems of Semiarid Environments, Colorado State Univ., Fort Collins, p 42-59, (1972) 7 fig, 2 tab, 8 ref.

Descriptors: *Groundwater resources, *Irrigation water, *Water transfer, *Inter-basin transfers, *Water supply, Colorado, Semiarid climates, Water management(Applied), Water policy, Water utilization, Competing uses, Water law, Water resources, Water allocation(Policy), Beneficial use, Imported water, Groundwater recharge, Saline soils, Saline water.
Identifiers: *Northern high plains.

If irrigation agriculture is to be expanded on a large scale, there are major advantages for it to be done in areas having long growing seasons and mild winters, such as the Southwest. Expansion there will be impossible in the future without importation of water. Two problems for irrigated areas are noted: (1) Diminishing water supply, particularly groundwater, and (2) Areas having salinity problems, both in soils and water supplies. The High Plains of eastern Colorado is suggested as a possible site as its economic health and ground water supply is projected for about 25 years. This region is extensively described and the inter-basin water transfer outlook for west to east importation is reviewed. (See also W76-00179) (Robinett-Arizona)
W76-00181

ARIZONA GROUND WATER LAW: THE NEED FOR LEGISLATION,
Arizona Univ., Tucson. Coll of Law.
R. E. Clark.
Arizona Law Review, Vol 16, No 4, p 799-819, 1975. 114 ref.

Descriptors: *Water law, *Water policy, *Water supply, *Water allocation(Policy), *Groundwater availability, Arizona, Legal aspects, Water rights, Water resources development, Prior appropriation, Water transfer, Competing uses, Planning, Water utilization, Water requirements, Reasonable use, Political aspects, Social aspects, Water wells, Groundwater mining, Overdraft, Well regulation, Water management(Applied).
Identifiers: Central Arizona project.

As a result of Arizona's non-management approach to groundwater, the state is very late in recognizing the long term importance of groundwater for all types of uses. The rate of increase of groundwater withdrawal and the existing conditions in central Arizona make it essential that appropriate legislation be enacted. Two proposals are outlined to provide a basis for complementary legislation and a state-wide water management plan: the registration of all wells except those certified to withdraw minimum quantities of water, and declaration of the entire state as a critical groundwater unit, prohibiting new withdrawals with exceptions for minimum withdrawals. (Robinett-Arizona)
W76-00188

AN ECONOMIC ANALYSIS OF THE PATTERNS AND TRENDS OF WATER CONSUMPTION WITHIN THE SERVICE AREAS OF THE HONOLULU BOARD OF WATER SUPPLY,
Hawaii Univ., Honolulu. Water Resources Research Center.
H-S. Oh, and H. Yamauchi.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 040, $5.25 in paper copy, $2.25 in microfiche. Technical Report No 84, December 1974. 97 p, 10 fig, 15 tab, 70 ref, 13 append. OWRT A-030-HI(3). 14-31-0001-3511.

Descriptors: *Water demand, *Pricing, *Water consumption, Urbanization, Conservation, Costs, *Hawaii, Water utilization, Water supply, Water users, Projections, Water conservation, Groundwater, Institutions.

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Identifiers: *Economic analysis, *Water consumption patterns and trends, Honolulu(HI).

During the period 1960-1971 the average daily per capita use of water in the nine service areas of the Honolulu Board of Water Supply increased by about 27% from 139 to 177 gal (526 to 670 l). Wide variations, however, were observed over both space and time. Large variations are related to changes in construction activity. A steadily widening gap between summer and winter use, approximately a million gallons per year, is related to expanding outdoor sprinkling uses. Differences in single vs. multiple dwelling use patterns of water are also explained by difference in outdoor sprinkling uses. There is no evidence that residential and commercial water users have been responsive to water rate changes in the past. Large industrial users on the other hand appear to have responded to rate changes, but this responsiveness is closely associated with the availability of self-service wells which ultimately tap the same ground water source of the Board of Water Supply. The nonresponsiveness of commercial water users is due in part to central metering and payment of water bills. The quid pro quo feature of the 'price' concept is not directly applicable to the water users in most large commercial establishments. The same holds for large institutional facilities. Major implications of this study related to: (1) practical refinements of the requirements approach to projecting future water needs, (2) the serious institutional limitations in the use of pricing policy as a means of promoting water conservation although peak load pricing may be an effective way to reduce inequitable distribution of water supply costs, and (3) the crucial importance of institutions as a policy variable for bringing about better overall management of the groundwater resource.
W76-00275

RADIOCARBON AGES OF GROUND WATER AS A BASIS FOR THE DETERMINATION OF SAFE LIMITS OF AQUIFER EXPLOITATION,
Nova Univ., Fort Lauderdale, Fla. Life Science Center.
For primary bibliographic entry see Field 5B.
W76-00363

OUTDOOR RECREATION IN THE SALT-VERDE BASIN OF CENTRAL ARIZONA: DEMAND AND VALUE,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-00382

WATER AND THE WEST: THE COLORADO RIVER COMPACT AND THE POLITICS OF WATER IN THE AMERICAN WEST,
California Univ., Los Angeles. Dept. of History.
For primary bibliographic entry see Field 6E.
W76-00384

WILL TEXAS HAVE ENOUGH WATER FOR THE ELECTRIC UTILITY INDUSTRY,
Texas Water Development Board, Austin. Operations Div.
B. Hoffman, and C. Chandler.
Water for Texas, Vol 4, No 12, p 5-9, December, 1974. 3 fig, 1 tab.

Descriptors: *Electric power plants, *Cooling water, *Industrial water, Cooling towers, Environmental engineering, Thermal pollution, Water conservation, Humidity, *Texas.
Identifiers: *Cooling ponds, Electrical consumption.

The effects of apparently dwindling fossil fuel reserves and rising fuel costs have been severely felt by the electric utility industry. The present concern over the availability of fuel supplies may give way to the concern for the availability of water to cool and operate these plants. At present, steam-electric plants account for over 96 percent of the power generated in the state of Texas. Steam-electric power plants must circulate large volumes of water through their condensers to remove waste heat. The water evaporated in this process is now over 90 percent of the water consumed by the electric utility industry. By the year 2000 projections place the use of water by Texas power plants at 1,340 to 1,785 million gallons per day. Internal cooling systems where surface water is passed through the cooling tubes and returned to a natural water body increase the rate of evaporation in the water body. External cooling systems which are more expensive to install, cool the water before discharge. In a low natural evaporation area cooling ponds could be used satisfactorily, and in very high evaporative areas, such as west Texas the wet cooling tower would be the least expensive and least wasteful. (Bradbeer-NWWA)
W76-00421

6E. Water Law and Institutions

PANEL ON DISCIPLINE VIEWPOINTS AND POSITIONS: POLITICAL SCIENCE AND LAW,
Wyoming Univ., Laramie. Coll. of Law.
F. J. Trelease.
In: Proceedings of the Conference on Interdisciplinary Analysis of Water Resource Systems, University of Colorado, Boulder, June 19-22, 1973. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, p 41-54, 1975.

Descriptors: *Water resources development, *Planning, *Projects, Economics, Water law, Social aspects, Governments, National Water Commission, Water supply, Wyoming, Nebraska, Water rights.
Identifiers: *Interdisciplinary planning, Lawyers, Political scientists, Sensitivity.

A review is presented of the kinds of help that can be obtained from persons trained in law and government and a warning to avoid past mistakes; considered are the form and function of the law and the role of the lawyer in water resources engineering and economics. Engineers and economists have often misunderstood the law, leading to less efficient projects and even to project failure. Recommended is the teaming-up of lawyer, engineer, social scientists, and scientist at the preliminary stages of project or proposal formulation. This is illustrated using an example water supply planning situation of the North Platte basin in Wyoming and Nebraska. In the final stages of plan implementation, the lawyer's skills as an advocator may be required; the lawsuit serves a useful and necessary function in situations where rights clash. Although similar, the work of the political scientist is more concerned with form, arrangements and processes than with the particular actions that most concern the lawyer. Leading more in the direction of optimization, perhaps the political scientist can do more with his institutions and advice to translate technical knowledge into actions which meet social goals than can new laws. The extent to which the lawyer and political scientist contribute effectively to project development depends upon the sensitivity of those in charge to legal and institutional problems. Recent work of the National Water Commission provides an example of such sensitivity, and lack of it. (See also W76-00060) (Bell-Cornell)
W76-00063

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY,
Corps of Engineers, New York. North Atlantic Div.
For primary bibliographic entry see Field 6B.
W76-00072

IMPLEMENTATION OF INTERSTATE WATE QUALITY PLAN,
Delaware River Basin Commission, Trenton, N.
For primary bibliographic entry see Field 5G.
W76-00083

THE HIGH PLAINS: PROBLEMS SEMIARID ENVIRONMENTS.
For primary bibliographic entry see Field 6D.
W76-00179

LEGAL PROBLEMS AND SOLUTIONS TO SU FACE-GROUND-WATER MANAGEMENT,
Colorado State Univ. Fort Collins. Dept. Economics.
For primary bibliographic entry see Field 6D.
W76-00180

TRANSMOUNTAIN WATER DIVERSION F THE HIGH PLAINS,
Colorado State Univ., Fort Collins. Environme Resources Center.
For primary bibliographic entry see Field 6D.
W76-00181

GOVERNMENTAL CONTROL OF LAND U IN ARIZONA (PRELIMINARY DRAFT),
Arizona Environmental Planning Commiss and Arizona House of Representatives, Phoeni
For primary bibliographic entry see Field 6A.
W76-00183

ARIZONA GROUND WATER LAW: THE NE FOR LEGISLATION,
Arizona Univ., Tucson. Coll of Law.
For primary bibliographic entry see Field 6D.
W76-00188

WATER AND THE WEST: THE COLORA RIVER COMPACT AND THE POLITICS WATER IN THE AMERICAN WEST,
California Univ., Los Angeles. Dept. of Histor
N. Hundley, Jr.
University of California Press, Los Angeles, 1 417 p.

Descriptors: *Colorado River Compa *Colorado River, *Semiarid climates, *W rights, *Federal-state water rights confl Arizona, California, Colorado, Colorado R Basin, Nevada, New Mexico, Utah, Wyom Boulder Canyon Project Act, Interstate compa Water shortage, Arid lands, Southwest U Legal aspects, Water law, Governmental inter tions, *History, Federal government, Water icy.

The Colorado River, the sole dependable w supply for an area of 244,000 square miles in ing parts of Wyoming, Colorado, Utah, New M ico, Nevada, Arizona, California, and Mexico been the cause of the greatest conflict over w in the American West. At the heart of the co is the fact that the river carries enough wate only a handful of cities, industries and farms. movement for the Colorado River Compac 1922 is traced, the complex legal and political tles that spawned the conflict and which con to influence the lives of Westerners today described. A major topic is federalism; the att of the Colorado Basin states to work out destiny in concert with the Federal Governme each side has sought to assert its supremac areas coveted by the other. Further eviden the important role played by Governme Federal, State and local - in the developme the West is discussed. Evidence is presente the Supreme Court in 1963 misread the hist record when formulating the landmark decisi Arizona v. California. The study confirms th portant role tradiationally assigned to Delph penter of Colorado in promoting the compac

lso reveals that Herbert Hoover played a key t in breaking the impasse that developed during final negotiations at Santa Fe in November, 2. (Robinett-Arizona)
6-00384

E DRILLERS LEGALLY RESPONSIBLE R GROUND WATER POLLUTION,
primary bibliographic entry see Field 5G.
6-00386

IMAL WASTE--REGULATORY CON-ERATIONS,
ert S. Kerr Environmental Research Lab., , Okla.
primary bibliographic entry see Field 5G.
6-00436

MMERCIAL FEEDLOTS-NUISANCE, ZON- AND REGULATION,
primary bibliographic entry see Field 5G.
6-00449

ISANCE LAWSUITS--NEIGHBOR VS. IGHBOR.
primary bibliographic entry see Field 5G.
6-00460

. Ecologic Impact Of Water Development

NEL ON DISCIPLINE VIEWPOINTS AND SITIONS: ECOLOGY,
consin Univ., Madison.
. Reed.
Proceedings of the Conference on Interdisciplin- y Analysis of Water Resource Systems, versity of Colorado, Boulder, June 19-22, 3. An American Society of Civil Engineers earch Activity, ASCE Project No 201.07/17- -4, New York, NY, p 55-62, 1975.

criptors: *Ecology, Ecosystems, Environ- t, Decision making, Management, Systems lysis, Mathematical models.
ntifiers: *Environmental quality, Biological ductivity, Human adaptability, Energy flow, rmation, Interdisciplinary analysis.

logy in its purest, most traditional sense is the dy of living organisms and their relationship to h other and to their non-living surroundings. ent preoccupation with the preservation of en- nmental quality has caused a vast expansion in meaning of ecology. Strictly speaking, ecology ains as environmental biology, concerned with cting a better understanding of biological ductivity (earth's carrying capacity for man) human adaptability (man's tolerance of the en- nment he himself creates). But now ecology is ing from the recesses of academia into the real ld of action and decision making. Precision is ded; a major handicap to establishing ecology science has been the lack of a fundamental with which to work. Only recently has the cept of an ecosystem emerged; herein, living anisms and non-living substances exchange erials as a result of a common energy flow. The rmous variety in nature presents problems in tification. Thus, a simplified classification em has emerged in which organisms are ped as producers, consumers, or decom- ers. Following pathways of materials through successive steps in food chains and determin- the energy efficiencies through various trophic ls are the means of obtaining basic ecological rmation. Ecosystems lend themselves to ems analysis for inventory, description, and surement in simulation, prediction and op- zation studies. Large ecosystems require inter- iplinary analysis and a comprehensive land- e, management model involving both technological and engineering features. (See also W76-00060) (Bell-Cornell)
W76-00064

INTERDISCIPLINARY APPROACH TO GEOTHERMAL DEVELOPMENT,
Bureau of Reclamation, Boulder City, Nev. Regions.
For primary bibliographic entry see Field 4B.
W76-00070

SPECTROSCOPIC INSTRUMENTS, SATELLITES AND COMPUTERS: NEW DIRECTIONS FOR MONITORING THE ENVIRONMENT,
Denver Research Inst., Colo.
For primary bibliographic entry see Field 7B.
W76-00315

A STUDY OF THE MEXICAN DUCK (ANAS DIAZI) IN SOUTHEASTERN ARIZONA,
Arizona Game and Fish Dept., Phoenix.
For primary bibliographic entry see Field 2I.
W76-00381

ENVIRONMENTAL EFFECTS OF DRILLING MUDS AND CUTTINGS,
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field 5C.
W76-00411

7. RESOURCES DATA

7A. Network Design

WATER MANAGEMENT MODEL IN FLORIDA FROM ERTS-1 DATA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 7B.
W76-00096

STRATEGIES FOR WATER QUALITY MONITORING,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W76-00178

THE TERASSPERC-A PROPOSED SI UNIT FOR THE FREQUENCY OF RECURRENCE OF A HYDROLOGICAL EVENT,
Bradford Univ. (England). Dept. of Civil Engineering.
M. F. Baty.
Hydrological Sciences Bulletin, Vol 20, No 1, p 47-50, March 1975. 6 ref.

Descriptors: *Flood recurrence interval, *Hydrology, Dimensional analysis, Frequency.
Identifiers: *Terassperc, *Hertz, *International system units, Unit conversion, Hydrological events.

In seeking to use SI units in accordance with British policy, a new SI unit for the frequency of occurrence of a hydrological event was devised. The derivation of the unit from the six (Later seven) base SI units was given. It was shown that every 996,000,000,000,000'th second the annual event occurs with a frequency of 1 hertz. This is within 0.4% of 1000 million million seconds per hertz, or 1000 million million seconds squared per cycle. In other words it is a 1000 terassperc event. This is well within the inherent errors of statistical methods. Thus the event which occurs on average once in 1000 years would have a terassperc value of unity. The SI unit for daily would be 365,000 sq Ts, weekly 52,000 sq Ts, and monthly 12,000 sq Ts. It is a matter for discussion whether a special name might be given to the 1000 terassperc, or annual, value. The unit has the advantage that the value increases directly the more often the occurrence, instead of the inverse relationship encountered with in the use of return period. The value in the derived SI unit is numerically equal to one thousand divided by the return period in years. The 50 year flood is a 20 terassperc flood. (Lardner-ISWS)
W76-00297

INSTRUMENTATION FOR MONITORING WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5A.
W76-00360

7B. Data Acquisition

MEASUREMENT AND ANALYSIS OF VERY SHORT DURATION RAINFALL,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 2B.
W76-00002

COMPARISON OF EVAPORATION MEASUREMENTS USING DIFFERENT METHODS,
British Meteorological Office, Cambridge (England). Research Unit.
For primary bibliographic entry see Field 2D.
W76-00020

VALIDITY OF SOIL-WATER SAMPLES COLLECTED WITH POROUS CERAMIC CUPS,
Forest Service (USDA) Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 5A.
W76-00024

QUANTITATIVE PREDICTION OF SEASONAL RATING CURVE SHIFTS,
National Weather Service, Kansas City, Mo. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-00026

INCLUSION OF PLANT MOISTURE STATUS IN COMBINATION-METHOD ESTIMATES OF PASTURE EVAPORATION,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 2D.
W76-00027

WATER MANAGEMENT MODEL IN FLORIDA FROM ERTS-1 DATA,
Geological Survey, Miami, Fla.
A. L. Higer, A. E. Coker, E. H. Cordes, and R. H. Rogers.
Final contract report, 1975. 42 p, 20 fig, 1 tab, 18 ref.

Descriptors: *Water management(Applied), *Surface waters, *Remote sensing, *Satellites(Artificial), *Florida, Hydrologic data, Data collections, Methodology, Model studies, Rainfall, Streamflow, Water yield, Water levels, Lakes, Data transmission, Tracking techniques, Networks, Water supply, Water resources development.
Identifiers: *Southern Florida, NASA, LANDSAT.

A prototype data acquisition and dissemination network, installed and operated by the U. S. Geological Survey, is a viable approach for providing the near real-time data needed to solve hydrologic problems confronting the nearly 2.5 million residents of southern Florida. Water-stage

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and rainfall data from ground stations are transmitted from the Everglades via LANDSAT, previously known as ERTS (Earth Resources Technology Satellite), the NASA tracking stations, and the U.S. Geological Survey to the users in less than 2 hours, a significant improvement over conventional techniques requiring up to 2 months. LANDSAT imagery significantly enhances the utility of the ground station measurements. Water stage (Depth) is correlated with water-surface areas from the imagery to obtain water stage-volume relations in near real time for management decisions concerning the distribution of water to the people, fauna, and flora of southern Florida. (Woodard-USGS)
W76-00096

EVALUATION OF A THERMOCOUPLE HYGROMETER FOR MEASURING LEAF WATER POTENTIAL IN SITU,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 2I.
W76-00153

THE MEASUREMENT OF HEAVY RAINFALL OVER SMALL CATCHMENTS USING RADAR,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W76-00300

THE UTILITY OF SURFACE TEMPERATURE MEASUREMENTS FOR THE REMOTE SENSING OF SURFACE SOIL WATER STATUS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-00305

SIMPLE METHOD FOR MEASURING RELATIVE HUMIDITY, WATER AND AIR TEMPERATURES WITHIN A FEW MILLIMETERS OF WIND-GENERATED WATER WAVES,
Naval Research Lab., Washington, D.C.
A. H. Schooley.
Journal of Physical Oceanography, Vol 5, No 3, p 519-522, 1975. 6 fig, 8 ref.

Descriptors: *Humidity, *Waves(Water), Water temperature, Air temperature, Winds, Laboratory tests, Evaporation, Turbulent boundary layers, Thin films, Diffusion.
Identifiers: *Thermister, *Relative humidity, Wet bulb temperature, Dry bulb temperatures, Turbulent diffusion, Laminar layer, Molecular sublayers, 16 mm cine film, Water-wind tunnel.

A very short time-constant thermister, mounted on a streamlined strut, was placed to measure alternately the water and air temperatures during the passage of wind-driven water waves in the laboratory. The results were preserved by using a high-speed recorder. A thin film of water was found to cling to the thermister upon emerging from a wave and its evaporation recorded the wet-bulb temperature, followed immediately by the dry-bulb temperature when evaporation was complete. Thus, the relative humidity within a few millimeters of the wavy water surface was determined. Under the set of conditions used, it was found that molecular diffusion is important in the first few millimeters from the actual water surface before the transition to turbulent diffusion predominates. (Roberts-ISWS)
W76-00310

SPECTROSCOPIC INSTRUMENTS, SATELLITES AND COMPUTERS: NEW DIRECTIONS FOR MONITORING THE ENVIRONMENT,
Denver Research Inst., Colo.
C. F. Heins, F. D. Johnson, and E. C. Mangold.
Environmental Science and Technology, Vol 9, No 8, p 720-725, August 1975. 3 fig, 1 tab, 5 ref.

Descriptors: *Pollutant identification, *Instrumentation, *Data processing, *Environment, Environmental engineering, Spectroscopy, Satellites(Artificial), Remote sensing, Infrared radiation, Computers, Data storage and retrieval, Data transmission, Water quality, Air pollution, Surface waters, Equipment.
Identifiers: *LANDSAT, ERTS-1.

At all levels of government there is an unprecedented demand for comprehensive, accurate, and timely information on the environment. As a result, new and greatly improved ways of obtaining environmental data are being developed to meet the demand. This article examines four developments that are transforming the entire field of environmental measurement: (1) spectroscopy, (2) satellite transmission of environmental data, (3) remote sensing, and (4) computerized data processing. A few examples for each development were described. (Sims-ISWS)
W76-00315

A NEW MEASURE OF BIOTIC SIMILARITY BETWEEN SAMPLES AND ITS APPLICATIONS WITH A CLUSTER ANALYSIS PROGRAM,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Labs.
C. F. A. Pinkham, and J. G. Pearson.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A001 466, $3.25 in paper copy, $2.25 in microfiche. October 1974, 23 p, 13 ref, 2 fig, 3 tab.

Descriptors: *Analytical techniques, *Statistical methods, *Biological communities, Water pollution control, Surveys, Computer models, Speciation, Monitoring, Bioindicators, *Pollutant identification.
Identifiers: *Cluster analysis, *Biotic similarity, *Species composition.

A new measure of biotic similarity is proposed and its use in a matrix analysis program outlined. It is shown by comparisons and examples that this index is more versatile than all previous indices and should be the measure of choice when examining two or more samples in which species composition is an important consideration. (Katz)
W76-00325

INSTRUMENTATION FOR MONITORING WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5A.
W76-00360

MONITORING THE ENVIRONMENT,
Denver Research Inst., Colo.
For primary bibliographic entry see Field 5A.
W76-00361

DESIGN AND FABRICATION OF A BOREHOLE LOGGING DEVICE FOR USE IN GROUND WATER OPERATIONS,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-00397

SOME HYDROGEOPHYSICAL PROPERTIES OF THE BUNTER SANDSTONE OF NORTHWEST ENGLAND,
Birmingham Univ. (England).
For primary bibliographic entry see Field 2F.
W76-00413

A SIMPLE METHOD FOR DIRECT MEASUREMENT OF EVAPORATION OF SOILS, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 2D.
W76-00448

THE FIRST HYDROLOGICAL APPLICAT[ION] OF A SPACE PHOTOGRAPH, TAMIL NA[DU], INDIA, 1967,
Research Council of Alberta, Edmonton
G. Ozoray
In International Symposium on Development of Groundwater, November 26-29, 1973, Mad[ras], India, Vol 1, p Ia9-Ia11, 7 ref.

Descriptors: *Remote sensing, *Topogra[phy], *Caliche, *Deltas, *Mapping, Color, Vegeta[tion] effects, *Aerial photography, Groundwater
Identifiers: Gemini 11, Cauvery delta, V[eda] River, *India, Morphotectonic analysis, Gro[und] water exploration.

A color space photography taken by Astro[naut] Richard Gordon from an altitude of 850 k[m] September 14, 1966, during flight of Gemini 11 [was] used to delineate the Cauvery Delta of the V[eda] River as a hydrogeological unit. The sout[h] border was drawn accurately from color contr[ast]. The distinction of the laterite-capped areas f[rom] the hydrogeologically different alluvial ones [was] based on the purplish-red hue of the laterite or[e] picture. Morphotectonic lineaments were also [ob]served on the space-photograph. The glob[al] widespread, meridional-longitudinal rectang[ular] system and a southwest-northeast trend [were] recognized. (Bradbeer-NWWA)
W76-00486

7C. Evaluation, Processing and Publication

HOW TO USE THE COMPUTER TO [GET] BETTER CEMENT JOBS,
For primary bibliographic entry see Field 8F.
W76-00036

SMALL-STREAM FLOOD INVESTIGATI[ONS] IN MINNESOTA, OCTOBER 1958 TO S[EP]TEMBER 1973,
Geological Survey, St. Paul, Minn.
L. C. Guetzkow, and K. T. Gunard.
Open-file report, May 1975. 161 p, 8 fig, 1 tab.

Descriptors: *Flood data, *Small watersh[eds], *Minnesota, *Hydrologic data, Flood peak, F[low] discharge, Gaging stations, Rain gages, Rain[fall]-runoff relationships, Streamflow, Flow ra[tes], Basic data collections.
Identifiers: *Small streams(Minn).

A small-stream flood-investigation program [in] Minnesota was initiated in August 1958. This p[ro]gram was designed to provide flood data [on] streams having drainage areas generally less t[han] 50 square miles, placing particular emphasis [on] those less than 10 square miles. Present effo[rts] oriented toward the collection of hydrologic [data] that will form the basis for defining flood-frequ[en]cy characteristics and provide information [for] detailed hydrologic studies. Gages were insta[lled] at 159 selected sites over a period of 8 years (19[58]-65). Data collection has been discontinued at [25] sites because of unstable control conditions [or] highway relocations. Plans are to maintain the [ex]isting network of 124 stations until sufficient [data] are obtained to define regionalized flood-frequ[en]cy characteristics. Each station is equipped with [a] crest-stage gage, which records the peak st[age]. Discharge measurements are made throughout [the] range in stage to establish a peak-discharge r[ela]tion. To supplement the record of instantaneous peak discharges, 11 stations have also b[een] equipped with recording gages, from wh[ich] discharge hydrographs can be derived to show [the] total volume of runoff during floods. Most stati[ons] equipped with continuous recorders have had [au]tomatic tipping-bucket rain gages installed to [re]-

simultaneous records of water stage and
:ipitation. (WoodardiUSGS)
5-00085

**TER-QUALITY RECORDS FOR SELECTED
SERVOIRS IN TEXAS, 1972-73 WATER
ARS,**
logical Survey, Austin, Tex.
awson, and H. J. Davidson.
as Water Development Board Report 194, Au-
t 1975. 135 p, 10 fig, 46 tab, 14 ref.

criptors: *Water quality, *Reservoirs, *Texas,
emical analysis, *Basic data collections,
os, Sampling, Sites, Water chemistry, Inor-
ic compounds, Biological properties, Physical
perties.

iodically since October 1961, the U. S. Geologi-
Survey, in cooperation with State, Federal,
local agencies, has made comprehensive
er-quality surveys of selected reservoirs in
as. During the 1970 water year, the program
expanded to include periodic sampling of
y other reservoirs in the State where water-
lity surveys were not being made. Water-quali-
lata collected before October 1971 have been
lished previously. This report contains the
ilts of water-quality surveys of nine reservoirs
chemical analyses of samples collected
iodically from 54 reservoirs from Oct. 1971
ugh Sept. 1973. Maps show the locations of
er-quality collection sites. (Woodard-USGS)
6-00086

**OLOGIC MAP SHOWING SPRINGS RICH IN
RBON DIOXIDE OR CHLORIDE IN
LIFORNIA,**
logical Survey, Menol Park, Calif.
arnes, W. P. Irwin, and H. A. Gibson.
n-file map, 1975. 1 sheet, 12 ref.

criptors: *Water quality, *Springs,
lifornia, *Carbon dioxide, *Chloride, *Maps,
s, Chemical analysis, Hydrogeology, Geologic
ping, Geologic units, Water chemistry.

s map shows carbon dioxide-and chloride-rich
ngs in all geologic provinces in California. The
on-dioxide-rich springs issue mainly from
nciscan terrane; they also are rich in boron and
of the metamorphic type. Based on isotopic
, either the carbon dioxide or the water, or
, may be of metamorphic origin. Because of
magnesium values, the water of many of the
on-dioxide-rich springs is thought to have
ed through serpentinite. The chloride-rich
ers are most common in rocks of the Great
ley sequence. Nearly all are more dilute than
ent-day sea water. The similarity in isotopic
positions of the metamorphic carbon-dioxide-
water and the chloride-rich water may in-
te a similar extent of water-rock interaction.
odard-USGS)
5-00092

**TER RESOURCES OF GOVE, LOGAN, AND
LLACE COUNTIES, WEST-CENTRAL KAN-
,**
logical Survey, Lawrence, Kans.
McClain, E. D. Jenkins, K. M. Keene, and M.
abst.
sale by USGS, Denver, Colo 80225 and
ton, Va 22092 price $1.50 per set. Hydrologic
stigations Atlas HA-521, 1975. 2 sheets, 19

criptors: *Hydrologic data, *Groundwater
urces, *Streamflow, *Water quality, *Kansas,
er yield, Aquifer characteristics, Groundwater
ement, Water-level fluctuations, Chemical
ysis, Water utilization, Water resources
elopment.
tifiers: Wallace County(Kan), Logan Coun-
an), Gove County(Kan).

This 2-sheet atlas presents information on the geology and water resources of a three- county area in west-central Kansas. The report is intended primarily as a guide to the availability of groundwater, which is the main source of supply for domestic, stock, industrial, irrigation, and municipal uses. During the 13-year period 1958-71, water levels generally declined 5 feet or less in Gove, Logan, and northern Wallace Counties but declined more than 30 feet in sourthern Wallace County. Hydrographs for observation wells show the effect of groundwater development on water levels. The Ogallala aquifer (The principal water-bearing unit) has a saturated thickness of as much as 300 feet, and commonly yields 500 to 1,500 gpm of water to wells. The average annual streamflow of the Smoky Hill River (The principal stream) at the east boundary of Gove County is estimated to be 50,000 acre-feet. Water from the alluvium and terrace deposits is very hard and of the calcium sulfate type, water from the Ogallala Formation is generally hard and of the calcium bicarbonate type, and water from the Dakota Formation is soft and of the sodium bicarbonate type. (Woodard-USGS)
W76-00093

WATER RESOURCES OF WISCONSIN-UPPER WISCONSIN RIVER BASIN,
Geological Survey, Madison, Wis.
E. L. Oakes, and R. D. Cotter.
For sale by USGS, Reston Va 22092 Price $2.25 per set. Hydrologic Investigations Atlas HA-536, 1975. 3 sheets, 16 ref.

Descriptors: *Hydrologic data, *Water resources development, *Maps, *Wisconsin, River basins, Surface waters, Groundwater resources, Water quality, Hydrology, Hydrologic budget, Precipitation(Atmospheric), Surface-groundwater relationships, Hydrogeology, Groundwater movement, Streamflow, Water yield, Aquifer characteristics, Water utilization, Water supply.
Identifiers: *Upper Wisconsin River basin.

This 3-sheet atlas describes the physical environment, availability, distribution, movement, quality, and use of water in the upper Wisconsin River basin as an aid in planning and water management. General information is presented from data obtained from Federal, State, and local agencies. New field data were collected in areas where information was lacking. The upper Wisconsin River basin is the headwaters of the Wisconsin River drainage and includes about 2,730 square miles in northern Wisconsin (Upstream from the gage on the Wisconsin River at Merrill). An additional 50 square miles of the basin lies in Michigan and is not covered by this report. The report area includes parts of Forest, Langlade, Lincoln, Marathon, Oneida, Price, Taylor, and Vilas Counties. The average annual budget for a 30-year period (Calendar years 1931-60) indicates that, of the 31.3 inches of precipitation on the basin, 12.4 inches left as streamflow. This flow was equivalent to 2,546 cfs, or 1,646 mgd. The largest quantity of water that left the basin was 18.9 inches of evapotranspiration. Single-year budgets are shown for the dry (1948) and wet (1951) years. (Woodard-USGS)
W76-00094

INDEX TO U. S. GEOLOGICAL SURVEY COMPUTER FILES CONTAINING DAILY VALUES FOR WATER PARAMETERS TO SEPTEMBER 30, 1971, NORTHEASTERN REGION,
Geological Survey, Reston, Va.
C. R. Showen, and N. G. Stuthmann.
Available from National Technical Information Service Springfield, Va 22161 as PB-222 423, $10.00 printed copy; $2.25 microfiche. Water-Resources Investigations 25-73, June 1973. 354 p, 7 fig, 2 tab.

Descriptors: *Data storage and retrieval, *Hydrologic data, *Surface waters, *Northeast U. S., Streamflow, Water quality, Water temperature, Basic data collections, Chemical analysis, Sites, Computer programs, Data transmission.
Identifiers: *Hydrologic data storage index.

This report contains lists of stations in the Northeast Region of the United States where the U. S. Geological Survey collects water data either on a continuous basis or at least on a daily basis. The files contain daily values for streamflow, reservoir levels or contents, water temperatures, specific conductance, sediment discharge plus data for several other quality parameters that are measured by means of monitoring equipment or result from analyses of samples collected on a daily basis. The stations are listed according to station number within each State. Also included are the available retrieval options, the machine-readable output options, user charges, and how to obtain the data. (Woodard-USGS)
W76-00097

GROUND-WATER LEVELS IN THE UNITED STATES, 1968-72: NORTHEASTERN STATES.
Geological Survey, Reston Va.
Supt. of Documents, GPO, Wash. D. C. 20402 for $1.75 Water-Supply Paper 2140, 1974. 207 p, 14 fig.

Descriptors: *Basic data collections, *Groundwater, *Water levels, *Water wells, *Northeast U. S., Connecticut, Delaware, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Well data, Observation wells.

Water-level measurements conducted by the U. S. Geological Survey (1968-72) from wells in 13 northeastern states are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The heigth of the measuring point above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month. Each well is identified by means of (1) a local number that is provided for continuity with older reports and for other use as dictated by local needs, and (2) a code number serves not only to identify the well but also to locate it as a point on a map. (Woodard-USGS)
W76-00098

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PARTS 9 AND 10. COLORADO RIVER BASIN AND THE GREAT BASIN.
Geological Survey, Reston, Va.
Supt. of Documents, GPO, Wash. D.C. 20402, for Price $2.65. Water-Supply Paper 2148, 1974. 348 p, 1 fig, 40 ref.

Descriptors: *Basin data collections, *Water quality, *Surface waters, *Colorado River basin, *Great Basin, California, Idaho, New Mexico, Utah, Wyoming, Streamflow, Sediment transport, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Sampling, Sites.

During the water year ending September 30, 1969, the Geological Survey maintained 125 stations on 76 streams in the Colorado River Basin and the Great Basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 114 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 8 and daily at 51 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemi-

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cal quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 43 stations during the year ending September 30, 1969. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 25 stations. The stream discharge for a composite sample is usually the average of daily mean discharges for the composite period. The discharge reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W76-00099

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS--VOLUME 2. BASINS FROM OGEECHEE RIVER TO CARRABELLE RIVER.
Geological Survey, Reston, Va.
Supt. of Documents, GPO, Wash, D.C. 20402, price $6.35. Water-Supply Paper 2105, 1975. 797 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Flow rates, *Southeast U. S., River basins, Florida, Georgia, Atlantic Ocean, Gulf of Mexico, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow, Hydrologic data, Water levels, Lakes, Reservoirs.
Identifiers: Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the South Atlantic Slope and eastern Gulf of Mexico basins, Ogeechee River to Carrabelle River. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W76-00100

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON--VOLUME 2. UPPER COLUMBIA RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Wash DC 20402, price $5.50. Water-Supply Paper 2133, 1975. 674 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Columbia River, River basins, Pacific Ocean, Idaho, Montana, Washington, Gaging stations, Discharge(Water), Flow measurement, Flow rates, Average flow, Water levels, Lakes, Reservoirs, Hydrologic data.
Identifiers: *Upper Columbia River basin, *Pacific slope basins(Wash).

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Pacific slope basins in Washington, Upper Columbia River basin. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W76-00101

EQUILIBRIA IN AQUEOUS SOLUTIONS OF CHLORINATED ISOCYANURATE,
Lawrence Experiment Station, Mass.
For primary bibliographic entry see Field 5F.
W76-00116

STRATEGIES FOR WATER QUALITY MONITORING,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W76-00178

STATE OF ARIZONA WELL LOCATION MAP A-1, HOLBROOK AREA, PORTIONS OF APACHE, COCONINO, GILA, AND NAVAJO COUNTIES.
Arizona Oil and Gas Conservation Commission, 8686 N. Central Ave., Phoenix, June 1975. 2 tab.

Descriptors: *Maps, *Well data, *Wells, *Stratigraphy, Water wells, Drill holes, Oil wells, Test wells, Natural gas, Exploration, Helium, Stratigraphy, Geologic time, Hydrologic data, Arizona.
Identifiers: Well location maps.

The map shows the correct or near-correct location of the numerous wells drilled in the gross Hollbrook area in search of oil, natural gas, and helium; stratigraphic, potash, halite, and structural and hydrological information; and selected water wells. A table gives the well name and location along with the geologic age of the rock at the total depth. Records of these wells are on file in the office of the Arizona Oil and Gas Conservation Commission. Much of the information pertaining to wells drilled for oil, natural gas, and helium was abstracted from Arizona Well Information, Arizona Bureau of Mines Bulletin 185, 1972. Most of the data listed for wells drilled since June 1973 were abstracted from The Commission's publications, Arizona Well Information, Supplement 1, Report of Investigation Number 5, 1973, and Explanatory Text and Well-Data Tabulation accompanying Well Location Map Nine, 1975. (Robinett-Arizona)
W76-00187

WELL LOCATION MAP NINE, COLORADO PLATEAU PROVINCE, ARIZONA: APACHE, COCONINO, NAVAJO AND PORTIONS OF ADJACENT COUNTIES.
Arizona Oil and Gas Conservation Commission 8686 N Central Ave., Phoenix, Arizona, 1975. 45 p, 4 fig, 2 tab, 26 ref.

Descriptors: *Maps, *Well data, *Water wells, *Stratigraphy, Wells, Drill holes, Oil wells, Test wells, Natural gas, Exploration, Helium, Geologic time, Hydrologic data, Arizona.
Identifiers: Well location maps.

This map and the companion text present graphic and tabulated data designed to inform and assist those who are interested in the search for additional accumulation of hydrocarbons and constitutes the base for current and future subsurface geologic investigations by the Arizona Oil and Gas Conservation Commission. Tables give the well type, location, operator, number, lease, elevation, completion date, status, total depth, and stratigraphic unit at total depth. A total of 282 water wells are shown on the map. (Robinett-Arizona)
W76-00197

SUMMARY OF SNOW SURVEY MEASUREMENTS FOR MONTANA, 1922-1974,
Soil Conservation Service, Bozeman, Mont.
P. E. Farnes, and B. A. Shafer.
1975. 220 p.

Descriptors: *Snow surveys, *Snow co*, *Montana, Snowpacks, Snow managem*, Snow, Surveys, *Measurement, Water equival*, *Data collections, Climatic data, Hydrologic d*, Sampling, On-site data collections, Precip*tion(Atmospheric), Meteorological data.

All snow survey measurements made in Mon* since snow surveys were started in 1922 were s* marized. Monthly measurements of snow d* were tabulated along with water equivalent. S* stations have additional mid-month measurem* reported. Indexes and cross references were * vided. A few snow courses immediately adja* to Montana in Alberta, Saskatchewan, Idaho, * Wyoming were also reported. (Sims-ISWS)
W76-00291

SPECTROSCOPIC INSTRUMENTS, SAT* LITES AND COMPUTERS: NEW DIRECTI* FOR MONITORING THE ENVIRONMENT,
Denver Research Inst., Colo.
For primary bibliographic entry see Field 7B.
W76-00315

THE FIRST HYDROLOGICAL APPLICAT* OF A SPACE PHOTOGRAPH, TAMIL NA* INDIA, 1967,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 7B.
W76-00486

8. ENGINEERING WORKS

8A. Structures

WATER RESOURCES DEVELOPMENT * THE U. S. ARMY CORPS OF ENGINEERS* NEVADA: 1975.
For primary bibliographic entry see Field 5G.
W76-00184

WATER RESOURCES DEVELOPMENT * THE U. S. ARMY CORPS OF ENGINEERS* ARIZONA: 1975.
For primary bibliographic entry see Field 5G.
W76-00185

WATER RESOURCES DEVELOPMENT * THE U. S. ARMY CORPS OF ENGINEERS* UTAH: 1975.
For primary bibliographic entry see Field 5G.
W76-00186

DOWN-THE-HOLE HAMMER DRILLING,
R. McCallum.
Journal of the Groundwater Association of S* and Southwest Africa, Vol 1, No 1, p 5-9, Octo* 1974.

Descriptors: *Well drilling, *Drilling equipm* Penetration, Construction equipment, Drilling
Identifiers: *Downhole hammer dri* *Compressed air, Hard formations, Tungsten* bide bits.

Rotary drilling equipment using compressed a* the drilling medium, rather than a fluid, repre* a recent development within the water well in* try, and although conventional tricone bits* sometimes used in air rotary drilling, the * common tool used in consolidated, hard or * sive formations is the down-the-hole hammer. * combines the percussive action of cable * drilling with the rotary action of rotary dri* Faster penetration and a straighter hole are* vantages of this hammer. The bits feature tun* carbide inserts placed to produce straight, *

grade holes with maximum cutting efficiency and they can be repeatedly resharpened in the field. The method of operations is discussed. The number of bits, recommended rotation speeds, lubrication, and formulas for computing air supply to the hammer are mentioned. (Bradbeer-NWWA)
W76-00279

PLANNING AND CONSTRUCTION OF SEWER AND DRAINAGE SYSTEMS (PLANNING UND BAU VON KANALISATIONS--UND ENTWAESSERUNGSANLAGEN),
For primary bibliographic entry see Field 5D.
W76-00367

8B. Hydraulics

BAYOCEAN SPIT, OREGON: HISTORY OF DEVELOPMENT AND EROSIONAL DESTRUCTION,
Western Washington State Coll., Bellingham. Dept. of Geography.
For primary bibliographic entry see Field 2L.
W76-00004

STILLING BASIN DESIGN FOR LOW FROUDE NUMBER,
Illinois State Water Survey, Urbana.
N. G. Bhowmik.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11448, p 901-915, July 1975. 11 fig, 20 ref, 2 append.

Descriptors: *Froude number, *Outlet works, *Hydraulic jump, *Settling basins, Laboratory tests, Design data, Spillways, Turbulence, Energy loss, Hydraulics, Momentum equation, Baffles, Depth, Tailwater.
Identifiers: End sills, Forced hydraulic jump.

Laboratory tests were conducted to investigate the possibilities of increasing the energy loss and shortening the required stilling basin length for the Froude number range of 2.5 - 4.5. Data were collected for both the ordinary hydraulic jump and the forced hydraulic jump. Jumps were forced to form by the addition of appurtenances, such as baffle blocks and an end sill. A set of appurtenances and geometrical arrangements were found which performed satisfactorily. Comparison of the test data for the forced hydraulic jump with the data from an ordinary hydraulic jump for the same Froude number showed that the energy loss was increased, the required downstream depth of water was about 5% less than the sequent depth, and the jump was formed in a much shorter basin. (Adams-ISWS)
W76-00013

POINT SOURCE DISPERSION IN TURBULENT OPEN CHANNELS,
Bogazici Univ., Istanbul (Turkey), Dept. of Mathematics.
K. M. Atesmen.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11413, p 789-799, July 1975. 12 fig, 7 ref, 2 append.

Descriptors: *Open channel flow, *Dispersion, Numerical analysis, *Fluid mechanics, Hydraulics, Turbulent flow, Distribution, Velocity, Mathematics, Analysis, Variability.
Identifiers: *Point sources, Concentration, Skewness.

The effect of the initial distribution of dispersant was investigated by obtaining solutions for different initial instantaneous point and plane source distributions. The governing equations were converted to a tractable system of moment equations which was solved by a numerical method for the zeroth, first, second, third, and fourth moments of the longitudinal concentration distribution. The initial instantaneous point source was located at 0, 0.25, 0.50, 0.75, and 1.0 fractions of the flow depth. During the initial period of dispersion, the convective transport produced a considerable deviation of the moments of the dispersing cloud from the Gaussian long dispersion time conditions. The longitudinal dispersion in a turbulent open-channel flow was found to be strongly dependent on the vertical location of an instantaneous point source. (Adams-ISWS)
W76-00014

ANALYSIS OF FLOW THROUGH VEGETATION,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
For primary bibliographic entry see Field 4A.
W76-00015

HYDRAULIC MODEL STUDY OF A SETTLING BASIN,
Illinois State Water Works Association, Vol 67, No 7, p 367-372, July 1975. 7 fig, 2 tab, 2 ref.
H. W. Humphreys.
Journal American Water Works Association, Vol 67, No 7, p 367-372, July 1975. 7 fig, 2 tab, 2 ref.

Descriptors: *Hydraulic models, *Settling basins, *Laboratory tests, Water treatment, Model studies, Hydraulics, Tracers, Analytical techinques, Velocity, Instrumentation, Currents(Water), Current meters, Flow measurement, Distribution patterns, Spatial distribution, Temporal distribution, Prototype tests, Illinois.
Identifiers: Lithium.

Laboratory studies were performed on a scale model of a settling basin in the Central Water Filtration Plant, Chicago, Illinois. Study objective was improvement of flow conditions in prototype settling basins in order to improve quality of settled water applied to filters. The 1-to-24 scale model included the raw water supply channel, mixing basin with four end around mixing channels including paddle flocculators, upper and lower settling basins, and settled water collector. Model performance was evaluated by making slug tracer studies using lithium as tracer, measuring velocity distributions in upper settling basin, and taking time-lapse color photographs of dye advance in upper settling basin. Results showed model hydraulic performance was improved considerably after modifying with turning vanes in the 180 degree turn between the last two mixing channels. This modification reduced the range of peak tracer concentration at the five outlet valves in lower settling basin; however, tracer distributions at model outlet were not sensitive to modification. Upper settling basin velocity distributions improved significantly. Modification was recommended for installation in prototype. (ISWS)
W76-00022

FRACTURING IN THE ZONE AROUND A BLASTHOLE, WHITEPINE, MINNESOTA,
Bureau of Mines, Minneapolis, Minn. Twin Cities Mining Research Center.
D. E. Siskind, R. C. Steckley, and J. J. Olson.
Report of Investigations 7753, 1973. 20 p, 9 fig, 2 tab, 16 ref, append.

Descriptors: *Rock mechanics, Cores, *Wells, *Mining, Construction, *Explosives, Permeability, Porous media, *Minnesota.
Identifiers: Well stimulation, Blasting, Well rehabilitation, Well fracturing, *Blastholes, In situ mining.

The Burea of Mines has studied the fracturing and associated damage occurring in the vicinity of blastholes from five shots fired in the shale pillars in the White Pine copper mine, White Pine, Mich. Four types of explosives (AN-FO, commercial extra dynamite, ammonia gelatin dynamite, and a low-density, low-velocity permissible) were used. Cores were taken from the blast region and examined by ultrasonic and petrographic techniques. Pulse wave velocities were measured across the core diameters, and thin sections showing cracks and changes in lithology were examined in an attempt to establish zones of damage. Cores from the blast regions and areas near pillar free faces were found to have abnormally low pulse velocities. Petrographic study of the thin sections showed that the negative velocity anomalies were caused by cracks in the cores. Crushing and extensive fracturing prevented meaningful measurements on core fragments from the immediate blast vicinities. Compositional changes and other rock nonuniformities, such as joints and preexisting fractures, tended to mask detailed damage differences among the four explosive; however, the two most energetic explosives (extra dynamite and ammonia gelatin dynamite) produced damage zones two to three times as large as the AN-FO and low-velocity permissible explosives. (Campbell-NWWA)
W76-00035

CEDAR CREEK AT CEDARTOWN, GEORGIA--FLOOD FLOW CHARACTERISTICS AT BRIDGE SITE OF GEORGIA AVENUE RELOCATION (SUPPLEMENT TO OPEN-FILE REPORT 75-46),
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 4A.
W76-00084

LOOP-RATING CURVES FOR VARIOUS UNSTEADY FLOWS,
Geological Survey, Reston, Va.
C. Lai.
In: Hydraulic Engineering for Optimal Use of Water Resources (Program and Abstract Papers), Proc. of ASCE Hydraulics Div. 23rd Annual Specialty Conference, August 6-8, 1975, Seattle, Wash: American Society of Civil Engineers Pub, Session 5B, Paper No 1, 1975. 1 p.

Descriptors: *Mathematical models, *Unsteady flow, *Streams, *Estuaries, *Flow characteristics, Hydraulic design, Planning, Streamflow forecasting, Floods, Rainfall-runoff relationships, Tidal Streams, Rating curves.
Identifiers: *Loop-rating curves.

A basic mathematical model, which uses the method of characteristics to compute unsteady flows, has been modified to plot numerous 'loop-rating' (Stage-discharge) curves for a variety of unsteady flow simulations. The loop-rating curves for floods in upland rivers are similar to those from ordinary flood measurements, whereas, curves from tide- affected reaches are strikingly different, but they, in general, resemble mirror images of the flood loops. Among those curves generated within tide-affected reaches are a wide range of loop shapes, such as those exhibited near the mouth, in the zone of flow reversal, in the zone of unidirectional pulsating flow, and near the end of tidal influence. Another group of loops characterizes the flow in a waterway connecting two rivers, reservoirs, or seas. Another set of rating curves is obtained in a very long river reach in which the downstream part is tide-affected and the upstream part, though not tide-affected, receives flood flow. (Woodard-USGS)
W76-00088

STRESS DETERMINATION BY HYDRAULIC FRACTURING IN SUBSURFACE WASTE INJECTION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5E.
W76-00089

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HYDRAULIC JUMP IN A ROUGH CHANNEL,
Toronto Univ., (Ontario). Dept. of Mechanical Engineering.
H. J. Leutheusser, and E. J. Schiller.
Water Power and Dam Construction, Vol 27, No 5, p 186-191, May 1975. 10 fig, 11 ref.

Descriptors: *Hydraulic jump, *Air entrainment, *Channel flow, *Open channel flow, *Roughness(Hydraulic), *Boundary layers, Turbulence, Froude number, Supercritical flow, Laboratory tests, Analytical techniques, Aeration, Mixing, Potential flow, Flow, Hydraulics Inflow, Sluice gates, Flumes.
Identifiers: *Fully-developed flow, Quasi-potential flow.

A hydraulic jump with fully developed inflow (in which the boundary-layer thickness equals the depth of flow) is more turbulent and entrains more air than the classical jump with undeveloped or quasi-potential flow. Experiments were carried out downstream of a sluice gate in a horizontal, rectangular open channel flume to investigate the development of supercritical channel flow and the performance of hydraulic jumps with fully-developed inflow. Tests were run on four different roughness surfaces which covered the entire length and width of the channel. The experimental results indicated that non-dimensional conventional jump length decreases with an increase in relative roughness. It was shown that with an increase in relative roughness, there is: (1) a trend towards greater steepness of the upstream roller face, (2) an increase in sequent-depth ratio, and (3) an increased tendency for low Froude-number jumps to assume a wavy-surface profile. Roughness accelerates flow development and hence engenders the formation of hydraulic jumps which have very desirable properties as promoters of intense mixing and gas transfer. (Singh-ISWS)
W76-00311

MICHIGAN DEMONSTRATION EROSION CONTROL PROGRAM,
Michigan Dept. of Natural Resources, Lansing. Water Development Services Div.
W. D. Marks, and F. A. Clinton.
Shore and Beach, Vol 42, No 2, p 11-17, October 1974. 7 fig.

Descriptors: *Beach erosion, *Waves(Water), *Erosion, *Stabilization, *Shores, *Lakes, *Michigan, Lake Michigan, Lake Superior, Groins(Structures), Breakwaters, Cost analysis, Costs, Economics, *Erosion control, Shore protection, Projects, *Great Lakes.
Identifiers: *Rock revetments, Nami rings, Z-walls, Beach nourishment.

Various shore protection methods utilized by the State of Michigan, Department of Natural Resources, were described. Wind-generated waves in three of the largest Great Lakes in and around Michigan caused substantial erosional damages to the shores of these lakes and significant property losses. The objective of these demonstration projects was to test and recommend an economically feasible shore protection method which would cost an individual property owner about $50 per front foot of shoreline. Eighteen projects were described, including types of construction, materials used, unit cost and the effectiveness of the protective measures. Methods used to protect shores were: rock revetments, timber groins, gabion groins, Dura Bags, breakwater, Z-wall, Longard tube, asphalt mastic covered rock groin, sand filled nylon bags, beach nourishment, Nami Rings, and combinations of these methods. Filter cloth, rock filters, and sand filters were also used with these various methods. Cost varied from $21 to $72 per front foot of the shoreline. Evaluations of a few of the methods were not presented because they were constructed only a short time before publications. (Bhowmik-ISWS)
W76-00313

PLASTIC OUTFALL LAID EXTRA DEEP.
For primary bibliographic entry see Field 5E.
W76-00343

ANOTHER LOOK AT THE NRC FORMULA,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-00368

PHYSICAL AND SETTLING CHARACTERISTICS OF PARTICULATES IN STORM AND SANITARY WASTEWATERS,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-00372

THEORY AND APPLICATION OF THE SKIN EFFECT CONCEPT TO GROUND WATER WELLS,
Maryland Univ., College Park. Dept. of Civil Engineering.
Y. M. Sternberg.
In: International Symposium on Development of Ground Water Resources, November 26-29, 1973, Madras, India, Vol 2, p III 23-III 33, 1 tab, 10 ref, append.

Descriptors: *Drawdown, *Water wells, *Hydraulics, Flow, *Groundwater movement, Yield equations, Productivity.
Identifiers: *Skin effect, *Productive capacity, *Pressure build-up, Radial flow, Pressure distribution.

Field analysis have shown that a zone often exists in the vicinity of a well bore whose permeability is substantially lower than that of the rest of the formation. The increased head loss or pressure drop that results from the lower permeability is termed the skin effect. Though a method for determining the skin effect from recovery or pressure build-up data of the pumped well is applicable to oil wells, water wells normally exhibit a very rapid build-up or recovery curve once the well is shut off and the skin effect cannot be readily determined. Two unsteady state flow equations are formulated and solved for a well where the skin effect is present and are compared with good agreement. In the first, permeability near the well decreases with drawdown and time due to migration of fines, and incrustation. The two regions are uniform but different. In the second model that equation for drawdown distribution due to a fully penetrating well in a confined aquifer is modified by the addition of a head loss under steady state conditions. A table comparing the solutions of these two equations is presented. (Bradbeer-NWWA)
W76-00399

PARTIALLY PENETRATING WELL IN A CONFINED AQUIFER,
Osmania Univ., Warangal (India). Regional Engineering Coll.
P. G. Sastry, and P. Prakasam.
In: International Symposium on Development of Ground Water Resources, November 26-29, 1973, Madras, India, Vol 2, p III 33-III 42, 7 fig, 8 ref.

Descriptors: *Water wells, *Aquifers, *Penetration, *Discharge(Water), Well spacing, *Groundwater movement, Wells, Aquifer properties, Hydraulics, Water yield, Confined water, Base flow.
Identifiers: *Partially penetrating wells.

A critical review of the existing methods to analyze the flow toward a partially penetrating well in a confined aquifer is made. The method of electrical analogy is employed to analyze the flow towards a partially penetrating well in a confined aquifer. The effect of penetration fraction on the discharge and additional drawdown is significant. The increase in penetration does not give rise to a proportional increase in yield. This is especially true beyond a penetration of half the aquifer thickness. The discharge ratio increases with increase in the ratio of radius of influence to well radius. The ratio of the aquifer thickness to the radius of influence is inversely related to the discharge ratio, though it is less significant than the previous parameters. The effect of partial penetration is less pronounced in wells of a larger radius. Finally, a drop in the discharge can be observed for the same penetration when the aquifer thickness is large compared to the well radius. The results of the tests conducted on this study are in support of Wen Hsiung Li's and Muskat's investigations. (Bradbeer-NWWA)
W76-00400

STUDIES ON A WELL PENETRATING A TWO-AQUIFER SYSTEM,
Indian Inst. of Tech. Madras.
M. H. Abdul Khader, K. Elango, M. K. Veerankutty, and G. Satyanandam.
In: International Symposium on Development of Ground Water Resources, November 26-29, 1973, Madras, India, Vol 2, p III-43-III-52, 5 fig, 1 tab, 4 ref.

Descriptors: *Aquifer systems, *Groundwater, *Discharge(Water), Continuous flow, Performance, Efficiencies, Evaluation, Resistance, Networks, Model studites.
Identifiers: *Two-aquifer system, *Multi-aquifer systems.

A theoretical formulation for the analysis of a well, penetrating a two-aquifer system with an unconfined aquifer at the top and a confined aquifer at the bottom is presented. The steady state performance characteristics of this system have been studied on a sand model, including the testing of each aquifer separately, and together at varying pump rates. An interference coefficient of discharge is defined and its values are determined from experimental data for different driving head conditions in the two aquifers. The values of the interference coefficient of discharge vary from 10 to 25 percent. This indicates the significance of the interference effects in a two aquifer system. (Bradbeer-NWWA)
W76-00401

A MATHEMATICAL APPROACH TO SOME ASPECTS OF GROUND WATER FLOW IN HARD ROCK AREAS,
Ground Water Inst., Poona (India).
For primary bibliographic entry see Field 4B.
W76-00402

SEEPAGE IN WELL SYSTEMS NEAR A BARRIER BOUNDARY,
Osmania Univ., Hyderabad (India).
D. B. Rao, and
In: International Symposium on Development of Ground Water Resources, November 26-29, 1973, Madras, India, Vol 2, p III-53-III-65, 6 fig, 3 ref.

Descriptors: *Drawdown, *Forecasing, Planning, *Well spacing, Mathematical models, Barriers, Hydraulics, Wells, *Seepage.
Identifiers: Drawdown patterns, Well location, Coefficient of interference, Drawdown ration, *Barrier boundaries.

Based on the principle of superpostion and the method of images a mathematical technique is developed to obtain the transient drawdown in the vicinity of well groups located near a barrier boundary. A straight line array of wells penetrating a phreatic aquifer is considered. Each well in the array is assumed to discharge at the same rate. Solutions are obtained using a digital computer to evaluate the exponential integral. In order to generalize the results, the concepts of drawdown ration, defined as the ration of drawdown to the saturated thickness of the aquifer, and the coeff

nt of interference and introduced. A parametric dy shows the effect of different variables which lude number of wells, well spacing, barrier tance, and pumping time. The usefulness of se tests in the design and analysis of well fields emonstrated. (Bradbeer-NWWA)
6-00403

DRAULICS OF SHALLOW WELLS IN HARD CKS,
nasskii Politekhnicheskii Institut (USSR).
T. Zhdankus.
International Symposium on Development of und Water Resources, November 26-29, 1973, dras, India, Vol 2, p III-105-III-114, 1 fig, 5 ref.

criptors: *Shallow wells, *Hydraulics, quifers, Hydrology, Confined water, Mathe- ical studies, Hydraulic conductivity, Dug well, e hole, Hydraulic radius, *Base flow, Equa- s, Groundwater.
ntifiers: *Radial flow, *Hard rock aquifers, ob's Principle.

general equation is used to unify and compare dy, unsteady, confined and unconfined radial nd water flow equations. Its validity is in- sed by applying it to hard rock aquifers of ables conductivity through depth. The equa- is further employed in the development of hods to analyze hard rock bore and dug well ping and recovery test data. The method for well data analysis is based on Jacob's princi- substituting the drawdown with the drawdown ction and taking into account water table drop the well opening. Dug well pumping and very test data can be used for the determina- of aquifer conductivity as a function of nd water inflow. Ground water inflow varies ng the test due to the significant storage city of the well. The specific yield is assumed the calculations and the radius of influence is ressed as a function of time. The proposed ations are also applicable to hydraulic compu- n of shallow water table wells in hard rocks. dbeer-NWWA)
5-00404

MMING OF FRESH WATER AFLOAT ON SALT WATER,
Univ. of Agriculture and Technology, Pant- ar, Govind Ballabh (India).
primary bibliographic entry see Field 4B.
5-00405

OCEDURES AND EQUIPMENT FOR PUMP- AND FREEFLOWING TESTS OF WATER LLS,
logical Survey of Australia, Melbourne. Mines t.
primary bibliographic entry see Field 8C.
-00406

TERICIDES USED IN DRILLING AND MPLETION OPERATIONS,
olite Corp., Tretolite Div. St. Louis, Mo.
primary bibliographic entry see Field 5C.
-00409

HYDROGEOLOGICAL INVESTIGATION FISSURE-FLOW BY BOREHOLE LOGGING HNIQUES,
ogical Sciences Inst., London (England).
primary bibliographic entry see Field 8G.
-00417

LD RESULTS: NOISE-LOGGING HNIQUE,
ullough Services, Houston, Tex. Research Development.
primary bibliographic entry see Field 8G.
-00423

SOME IN-SITU PERMEABILITY TESTS IN SANDS,
Halcrow (William) and Partners, London (England).
P. M. James.
Quarterly Journal of Engineering Geology, Vol 2, No 4, p 301-306, May, 1970. 2 fig, 1 tab, 4 ref.

Descriptors: *Permeability, *Water wells, *Water yield, *Aquifer testing, Subsurface flow, Test wells, Observation wells, Groundwater, Aquifer characteristics, Drawdown, Alluvial aquifers, Sand.
Identifiers: *In-situ permeability tests, *Maylaya.

The construction of a new head barrage for the Muda Irrigation Project, in northwest Maylaya, involved knowledge of the in-situ permeability of adjacent alluvial sands, in order to determine the extent of sheet pile cut-off needed on one side of the structure. The geological situation was determined from a number of earlier boreholes and a seismic traverse. Three wells were sunk to an impermeable layer and pump tests were made on each and the resulting drawdown measured in the remaining two. Permeability calculations were made using three different formulae. (Bradbeer-NWWA)
W76-00484

CAVITATION AND SIZE SCALE EFFECTS FOR ORIFICES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. P. Tullis, and R. Govindarajan.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY3, p 417-430, March, 1973. 9 fig, 1 tab, 10 ref.

Descriptors: *Cavitation, *Fluid mechanics, *Hydraulics, *Corrosion, *Orifices, Orifice flow, Nozzles, Pipes, Outlets, Hydraulic structures, Hydrology, Flow control, Flow rates, Flow system.
Identifiers: *Orifice size.

Data are presented for predicting various levels of cavitation for circular sharp-edged orifices of variable diameters and pressures. Values of the cavitation index at incipient (the onset of cavitation), critical, and choking cavitation are identified. Two subjective measures related to the interference with a normal conversational noise level, moderate and heavy cavitation regions are suggested. Pipe diameters ranged from 1.08 to 23.5 in., pressures from 20 to 200 psi and orifice/pipe size ratios from 0.332 to 0.884. Operation of an orifice at just below choking level is the time of maximum damage potential and unstable flow. The values of the cavitation index at choking vary with the orifice/pipe size ratio but are independent of size, pressure, and velocity. (Bradbeer-NWWA)
W76-00489

SCREEN THEORY FOR WELLS AND SOIL DRAINPIPES,
Iowa State Univ., Ames. Dept. of Agronomy.
M. S. Selim, and D. Kirkham.
Water Resources Research, Vol 10, No 5, p 1019-1030, October, 1974. 19 fig, 3 tab, 19 ref.

Descriptors: *Mathematical models, *Well screens, *Drainage systems, *Spatial distribution, Water wells, Flow, Flow system, Inflow, Flowrate, Fluid mechanics, Flow augmentation, Darcy's Law, Laplace's Equation.
Identifiers: *Screen theory, *Drain pipes.

A theoretical solution is given for steady flow in a confined aquifer to a well tube having equally spaced screens. It is shown, quantitatively, using Darcy's Law and Laplace's Equation, that more flow results if a given total length of screen is utilized in a number of sections over the full length of the well tube than if the given length of well screen is all used at the botton of the tube. For a pumped well of 0.25 foot radius, 200 foot radius of influence, 50 foot thickness of aquifer, and 25 foot length of screen, the use of the screen in five 5-foot sections equally divided over the well tube results in 25 percent more flow than if the sections are used in a single 25 foot length. Similarly ten 2.5 foot sections of screen will produce 33 percent more flow, and an infinite number of sections will increase the flow 45 percent. It is shown that the basic theory also applies to seepage flow to the joints between individual lengths of drainpipes used in land drainage. The results are presented in tables and graphs having dimensionless parameters so that flow for a particular system may be found in any unit. (Bradbeer-NWWA)
W76-00490

8C. Hydraulic Machinery

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ., Tucson. Div. of Economic and Business Research.
For primary bibliographic entry see Field 6B.
W76-00196

FACTORY AND FIELD TESTING OF PUMPS,
FMC Corp., Indianapolis, Ind. Pump Div.
R. A. Luley.
Journal of New England Water Works Association, Vol 86, No 4, p 330-346, December, 1972.

Descriptors: *Pump testing, *Performance, *Quality control, On-site Testing, Testing procedures, Venturi meters.
Identifiers: Field testing, Factory testing.

The Hydraulic Institute Test Code classifies pump tests as: (1) Factory tests at the pump manufacturers plant, and (2) Field tests at the place of installation. Pump performance is determined from four quantities: total energy added to the fluid by the pump, flow, power input to the pump shaft, and pump shaft speed. Total energy is calculated from the flow and pressure measurements, and the others are measured directly. The factory methods of testing are described. Since testing costs money, a problem arises in whether the acceptance test should be made at the factory or in the field. Most pumps provided with ideal flow conditions will perform better than with irregular flow. Field tests are useful to indicate wear and/or changing conditions from initial to future tests. The reliability of a field test is a function of the accuracy of the instruments used, their proper installation and proper use. Methods of field testing are described. Factory testing is the preferred method of accurate assessment of performance. (Bradbeer-NWWA)
W76-00281

PUMPING APPLICATIONS...SEWAGE, SLUDGE, AND SLURRY,
G. M. Leaney.
Pumps and Their Applications, No 105, p 770-773, June, 1975. 5 fig.

Descriptors: *Pumps, *Sewage treatment, *Centrifugal pumps, Impellers, Design criteria, Flow characteristics, Pumping, Maintenance costs, *Waste water treatment.
Identifiers: Positive displacement pumps, Rotodynamic pumps.

Types of pumps which may be used for controlling the flow of sewage are described and compared. Mechanical pumps are of two general categories--positive displacement and rotodynamic. Positive displacement action is one of compressing the medium; rotodynamic action is one of throwing. Two types of positive displacement pump designs are rotary and reciprocating. In rotary type pumps,

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all working parts rotate in one continuous direction so that discharge is uniform and regular. These are not suitable for handling large solids or abrasive materials. In reciprocating pumps, the general operating principle is that of a plunger driven back and forth, allowing the liquid into the cylinder, and emitting it at the opposite end of the stroke. Output from reciprocating pumps is pulsating and connecting pipelines are subject to pressure fluctuations. The other category of pumps, rotodynamic ones, have become widely used in sewage handling since the development of the open impeller type, a derivative of the centrifugal pump. Such pumps can cope with greater throughputs than can the positive displacement pumps. A uniform condition results from their use in that a definite head develops from the centrifugal pump, dependent upon the diameter of the impeller and the speed. Vertical type centrifugal pumps are positioned at the bottom of a pit; integral horizontal pumping units may be applied for pumping and tankage. While positive displacement pumps are more efficient than the rotodynamic pumps, the latter generally have lower maintenance costs and are less prone to wear in the handling of abrasive materials. (Kramer-FIRL)
W76-00344

INSTRUMENTATION AND AUTOMATION OF WASTEWATER TREATMENT SYSTEMS, (LITERATURE REVIEW),
National Environment Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-00364

MAKING THE MOST OF ROTARY PERCUSSION BITS,
Hughes Tool Co., Houston, Tex.
G. O. Atkinson, and M. Bender.
Water Well Journal, Vol 24, No 2, p 29-31, February, 1975. 7 fig.

Descriptors: *Rotary drilling, *Drilling equipment, *Efficiency, Drilling, Equipment, Wells, Rock mechanics, Drilling samples, Geologic investigations.
Identifiers: Rotary drilling percussion bits, Core, Handling, Reconditioning.

The greatest tool footage and fastest penetration rate can be achieved with rotary bits by observing three basin principles: (1) proper handling, (2) correct drilling practices, and (3) periodic reconditioning. The proper handling entails inspection for shipping damage, storage in a protective container and proper packing when transporting. Corrent drilling practives involve starting the air flow and rotation before applying preload to the bit and finding optimum running conditions of rotary speed and preload. A clean hole and careful sizing of a second bit in the same hole are usually helpful. Reconditioning involves sharpening the tungsten carbide buttons and restoring the gage relief taper. Most bits can be repeatedly reconditioned until the gage diameter has been reduced 1/2 inch. Further reconditioning will reduce the thickness of the outer heel row buttons below that required to resist breakage and will reduce the thickness of the metal at the circumference of the bit below that required to resist outer heal row button loss. (Cambell-NWWA)
W76-00385

THE ELECTRO-OSMOTIC GUILLOTINE, A NEW DEVICE FOR CORE CUTTING,
Bern Univ. (Switzerland). Geological Institut.
M. Sturm, and A. Matter.
Journal of Sedimentary Petrology, Vol 42, No 4, p 987-989, December, 1972. 3 fig, 4 ref.

Descriptors: *Marine geology, *Core sampling, Electro-osmosis, Unconsolidated sediments, Sediments.
Identifiers: *Core slicing, *Core cutting, *Electro-osmotic knife.

Cutting of unconsolidated pelitic sediments using the electro-osmotic effect was introduced in 1967. It is based on the electro-osmotic behavior of clays, that is if an electric field is applied to a clay mass the interstitial water is forced to flow from the positive to the negative electrode. Typically the core is cut starting from one end using a cheese cutter or knife connected to a DC source. Thereby, pebbles, pieces of wood or shells may be pushed along in front of the cutter causing distortion and grooves. The electro-osmotic guillotine splits the core simultaneously along its whole length. A core section up to one meter long is cut with this device. Drawings and specifications of the guillotine are included. The device minimizes the distortion of sedimentary structures and makes additional scraping unnecessary. (Campbell-NWWA)
W76-00389

COST COMPARISONS AND PRACTICAL APPLICATIONS OF AIR-LIFT PUMPING,
Universal Oil Products Co., Denver, Colo. Johnson Div.
D. L. Kill.
The Johnson Driller's Journal, p 1-3, September-October, 1974. 2 fig, 1 tab.

Descriptors: *Pumping, Water level, Power head, Measurement, *Cost comparisons.
Identifiers: *Air-lift pumps, Static water level, Pumping water-level.

Procedures for estimating the static water level in a well and the pumping water level are described for a well with a single-pipe airlift. Surging with compressed air without the use of an air line in the well as recently been successfully used during acid rehabilitation work. The procedure is outlined. In determining the needs of specific wells in relation to the magnitude of the required starting pressures and compressor volumes the starting pressure limits the depth of air line submergence. If the difference between total well depth and the static water level is less than 115 feet, a 50 psi compressor would have adequate starting pressure. Recommendations are made for varying well depths and static water levels. The volume of air needed is directly related to the volume of water desired to pump from the well. A table shows some average costs per cubic foot per minute of air for various size compressors. (Bradbeer-NWWA)
W76-00396

PROCEDURES AND EQUIPMENT FOR PUMPING AND FREEFLOWING TESTS OF WATER WELLS,
Geological Survey of Australia, Melbourne. Mines Dept.
C. R. Lawrence.
In: International Symposium on Development of Ground Water Resources, November 26-29, 1973, Madras, India, Vol 2, p III-141-III-151, 1 tab, 15 ref.

Descriptors: *Pump testing, *Performance, *Aquifer characteristics, Boundaries, Permeability, Transmissivity, Boundaries, Safe yield, Specific capacity, Wells, Groundwater, Water levels.
Identifiers: *Flowing testing, Pump installation.

The procedures for pumping and flow tests, the installation and operation of various types of pumps, and equipment for measuring discharge and water levels are reviewed. The constant discharge pumping test, the discharge-recharge test, the multiple stage test, the freeflowing and recovery test, and the bailing test are described. A table compares the types of pumps by maximum yield, maximum lift, advantages, disadvantages and their common uses. Methods of discharge measurement include calibrated drum and stopwatch and weirs. A discussion of measuring water level includes description of the use of chalked tape, the foa whistle sounder, the float-type indicator, the pneumatic indicator, the electric probe, the pressur transducer and the mercury gauge. (Bradbee NWWA)
W76-00406

ENVIRONMENTAL EFFECTS OF DRILLIN MUDS AND CUTTINGS,
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field 5C.
W76-00411

DRILLING TECHNIQUES IN BALL CLAYS,
Watts, Blake, Bearne and Co. Lt., Devonshi (England).
A. Vincent.
Quarterly Journal of Engineering Geology, Vol No 3, p 241-247, July, 1972. 1 fig, 3 ref.

Descriptors: *Drilling, *Drilling equipmen *Cores, *Clays, Civil engineering.
Identifiers: Basin, *Ball cla Devonshire(England), Oligocene clay.

In the strata of the oligocene clay basins Devonshire, wireline drilling increase the penetr tion rate by a factor of at least three. It eases th problem with casing and when used in conjunctio with mud flush, casing may not be necessary. Th strata penetrated in trail holes in Devon, Englan are a series of clays, lignites, sands, sandy clay and occasional bands of gravel. The lignites a the sands can cause difficulties including the lo of water return. Efficient bit design, as describe improves core recovery and lowers costs. Th wireline system, efficient bit design and mud flu have reduced costs on all cored footage, includi the cost of grouting and the restoration of th disturbance to agricultural land. (Bradbee NWWA)
W76-00415

WHICH PUMP.
WND-Worthington-Simpson Ltd., Newa (England).
R. A. Clark, and G. Geddes.
Engineering, Vol 212, No 11, p 1089-109 November, 1972. 12 fig.

Descriptors: *Pumps, *Equipment, Water co veyance, *Centrifugal pumps, Hydraulic equi ment, Hydraulic machinery, Design, Classific tion.

Different types of equipment available for th pumping of liquids are described. Kinetic pum are divided into centrifugal pumps, regenerati pumps, axial flow pumps and mixed flow pump Positive displacement pumps which are mo suited to handle high viscosity liquids and hi pressures are also divided into categories a described. Gear pumps, vane pumps, screw pum and steam pumps are examined. Gland packi and mechanical seals, two methods of controli leakage, are described. (Campbell-NWWA)
W76-00416

INTERIM REPORT ON DEVELOPMENT OF HAND OPERATED WATER PUMP FO DEVELOPING COUNTRIES,
Battelle Columbus Lab., Ohio.
R. D. Fannon, Jr.
Office of Health, Technical Assistance Burea Agency for International Development, Washir ton, D.C., August, 1974, 14 p, 2 fig, 3 tab.

Descriptors: *Pumps, *Equipment, Groundwat Design criteria, Research and Development.
Identifiers: *Handpumps, Underdeveloped cou tries.

e basic specifications for a dependable hand mp are, (1) low production costs, (2) long life der severe conditions, (3) easy to maintain with mple tools and unskilled labor, (4) suitable for llow or deep well installations with only minor anges, (5) capable of being manufactured by ablished firms within the developing countries h a minimum of capital investment, (6) easily erated by small people, and (7) include design rameters which will discourage pilfering and ndalism. Inadequate features of pump design y be: (1) cylinders too rough, (2) plunger cups properly sized, (3) highly stressed fulcrums and ndles, (4) bearing surfaces too small, (5) valve ts poorly cast and machined, and (6) fastners orly made. A pump configuration was veloped incorporating improvements for many the above deficiencies. It is described and will nd up well though further refinements need to made. (Bradbeer-NWWA)
6-00420

8. Soil Mechanics

E ELECTRO-OSMOTIC GUILLOTINE, A W DEVICE FOR CORE CUTTING,
rn Univ. (Switzerland). Geological Institut.
r primary bibliographic entry see Field 8C.
6-00389

ILLING TECHNIQUES IN BALL CLAYS,
tts, Blake, Bearne and Co. Lt., Devonshire ngland).
r primary bibliographic entry see Field 8C.
6-00415

C. Rock Mechanics and Geology

ACTURING IN THE ZONE AROUND A ASTHOLE, WHITEPINE, MINNESOTA,
reau of Mines, Minneapolis, Minn. Twin Cities ning Research Center.
r primary bibliographic entry see Field 8B.
6-00035

LEOHYDROLOGY OF THE CAVES IN THE ORAVSKY KRAS (MORAVIAN KARST),
skoslovenska Akademie Ved, Brno. ografický Ustav.
r primary bibliographic entry see Field 2F.
6-00394

DRAULICS OF SHALLOW WELLS IN HARD CKS,
unasskii Politekhnicheskii Institut (USSR).
r primary bibliographic entry see Field 8B.
6-00404

OLOGICAL SOCIETY ENGINEERING OUP WORKING PARTY REPORT ON THE GGING OF ROCK CORES FOR ENGINEER- G PURPOSES.
ological Society of London (England).
r primary bibliographic entry see Field 8G.
6-00412

E EFFECT OF GEOLOGICAL FEATURES THE OCCURRENCE OF GAS OUTBURST ACTURES IN THE EAST MIDLAND COAL- LD,
lf Research and Development Co., Pittsburgh,

C. Arscott, and P. Hackett.
arterly Journal of Engineering Geology, Vol 2, 2, p 89-101, December, 1969. 7 fig, 2 plates, 1 , 18 ref.

Descriptors: *Gas, *Methane, *Explosions, *Coal mines, Geology, Structural geology, Fractures(Geologic), Joints, Stress.
Identifiers: *Gas outbursts, *East Midlands Coalfield(England), Preferred orientation.

The phenomenon of gas outbursts from the floor of excavations in the East Midlands Coalfield is examined and their general features such as growth, preferred orientation, regional trends, and location are described. An attempt is made to correlate the distinct grouping of the fractures in the Deep Hard Seam in North Derbyshire and the Low Main Seam in North Nottinghamshire and their uniform directional tendency with the known geological features of the area. The geologic structure and the orientation of joints are considered. A series of underground investigations allied to laboratory work and literature surveys indicate that the general structural geology of the area controls the occurrence of the fractures. (Bradbeer-NWWA)
W76-00424

8F. Concrete

HOW TO USE THE COMPUTER TO GET BETTER CEMENT JOBS,
R. M. Beirute.
Drilling, Vol 36, No 9, p 29, June 1975.

Descriptors: *Computers, *Computer programs, *Computer models, Efficiencies, Data storage and retrieval, Optimization, Drilling, *Cement.
Identifiers: Computer assistance.

Computer programs developed by major oil companies can aid in the calculation of pressures in a well and pump rate limits, setting times of cement from temperature profiles, cement slurry design and cost advantages of various materials from readily available data as hole size, depth, and cement density and rheologies. The programs may simulate mud displacement or the flow and mixing times of additives to the drilling fluids. The computer also stores data in large amounts that become readily accessible. (Bradbeer-NWWA)
W76-00036

THERMOVISCOELASTICITY OF AGING CONCRETE,
Northwestern Univ., Evanston, Ill.
Z. P. Bazant, and S. T. Wu.
Journal of the Engineering Mechanics Division, Proceedings of the American Society of Civil Engineers, Vol 11, No EM3, p 575-597, June, 1974. 16 fig, 1 tab, 65 ref.

Descriptors: *Concretes, *Construction materials, *Creep, Strain, Stress, Concrete testing, Aging, Curing, Statistical analysis, Engineering structures, Materials engineering, Concrete technology, Temperature, Energy.
Identifiers: *Thermoviscoelasticity, Temperature dependence.

Temperature directly influences the deformation rate of concrete and also affects the rate of aging. In previous studies the acceleration of aging due to temperature rise have been disregarded. This study attempts to evaluate the effect and is restricted to creep at constant, or nearly constant, water content. Using the developed procedure all of the more extensive published data on temperature dependence of creep were analyzed. The creep of aging concrete at variable temperature can be modeled by a rate-type creep law with hidden stresses as internal state variables. The model here is restricted to linear stress. It is advantageous to add the concept of activation energy because it specified the form of temperature dependence and allows a limited amount of data to be used. The activation energy does not appear to depend on the duration of loading. All of the examined data fits this model satisfactorily. Activation energy of creep varies for different concretes. (Campbell-NWWA)
W76-00277

CEMENT SPACER FLUID,
Halliburton Services, Duncan, Okla.
L. L. Carney.
Journal of Petroleum Technology, p 156-158, August, 1974. 1 fig, 2 tab.

Descriptors: *Cements, *Well linings, *Well contamination, Cement viscosity, Drilling fluid.
Identifiers: *Cement spacer.

Completion problems during the cementing of casings or liners in wellbores have confronted the oil and gas industry for many years. Generally, after the borehole has been drilled, the drilling mud employed is displaced by the cement used in cementing the casing or liner. Compositions and properties of drilling muds and cement slurries vary widely. Such variation may result in detrimental physical and chemical reactions at the interfacial contact. For example, when a high-viscosity, high-density fluid is used, the incompatibility may contribute to channeling in the annulus and may prevent a satisfactory cement-to-foundation bond. As a result, communication may occur between zones and possibly even to the surface. The persistence of these problems indicated a need for a single type of spacer fluid that could be employed effectively between the cement slurry and any type of mud. A field survey was conducted on several wells in South Texas and Mississippi to determine what cementing problems were being encountered with various drilling fluids and cements. The survey indicated that oil-based fluids and invert emulsions cause most of the problems. An emulsion spacer was developed in which salts were eliminated from the internal phase of the drilling fluid and the water phase was increased so the spacer could have equal parts water and hydrocarbon. The spacer has been used on many jobs in the field with excellent results. (Bradbeer-NWWA)
W76-00387

EXPANSIVE AND SHRINKAGE CHARACTERISTICS OF CEMENTS UNDER ACTUAL WELL CONDITIONS,
Western Co. of North America, Dallas, Tex.
R. Beirute, and A. Tragesser.
Journal of Petroleum Technology, p 905-909, August, 1973. 5 fig, 3 ref.

Descriptors: *Expansion, *Concrete construction, *Well casings, *Construction materials, Test wells, Concrete technology.

A device has been developed that continuously monitors the expansion or shrinkage of cements that occurred under simulated oil well conditions of temperature and pressure. Preliminary studies using the device indicate that for tested slurries (listed): (1) the expanding tendency of the cements decreased as pressure and temperature were increased, (2) some cements showed an initial shrinkage after setting when cured at high-temperatures and pressures, (3) commercial expanding cements showed greater expansion and no initial shrinkage was observed, (4) increasing salt concentration decreased initial shrinkage and increased expansion, and (5) the selection of a proper reference time is vital in identifying the actual behavior of cements. (Bradbeer-NWWA)
W76-00390

8G. Materials

NEW BIT CONCEPTS GET TRYOUTS AT SANDIA LABORATORIES.
Engineering and Mining Journal, July, 1975, p 100-101, 3 fig.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Descriptors: *Wells, Drilling Oil Industry, Rotary drilling, Drilling equipment.
Identifiers: Rock bits, Continuous chain bit, Penetration rates, Spark drilling, Terra drill.

Four new drill bits designed to increase cutting rates and reduce costs are under development at the Energy Research and Development Administration's Sandia Laboratories in Albuquerque, New Mexico. Two of the drills--one chips rock with high voltage spark discharges and the other fires small projectiles into the rock in advance of a regular roller bit--are designed to increase both penetration rates and downhole bit life. The other two systems aim primarily at increasing bit life. One permits a roller-cone bit to be folded and removed as another bit is cycled into place from a magazine containing 10 to 12 new bits. The other system places cutting surfaces on a chain that is advanced to bring new cutting surfaces into position. If the bits are successful, they will have special significance for deep well drilling, where pulling pipe to replace dulled bits is both costly and time-consuming. (Campbell-NWWA)
W76-00034

ENVIRONMENTAL MONITORING: A NEW REQUIREMENT FOR THE MINING INDUSTRY,
For primary bibliographic entry see Field 5A.
W76-00037

OZONE STIFLES SEWAGE ODORS IN RESIDENTIAL AREAS,
New York City Dept. of Water Resources. Structural Section.
For primary bibliographic entry see Field 5D.
W76-00210

THERMOVISCOELASTICITY OF AGING CONCRETE,
Northwestern Univ., Evanston, Ill.
For primary bibliographic entry see Field 8F.
W76-00277

DOWN-THE-HOLE HAMMER DRILLING,
For primary bibliographic entry see Field 8A.
W76-00279

COATING FUNDAMENTALS,
S. J. Bellassai.
Materials Protection and Performance, Vol 11, No 12, p 55-58, December, 1972.

Descriptors: *Corrosion, *Protection, *Coatings, *Protective coatings, Paint, Tar, Plastics, Films, Specifications, Corrosion control, Application methods.
Identifiers: *Prevention.

Coatings should possess the following basic qualities in order to protect a structure from deterioration after burial: (1) good electrical insulation, (2) low moisture absorption and vapor transmission, (3) noncontamination of soil and water, (4) physical resistance to damage during handling and after burial, (5) high dielectric strength, (6) ease of application, (7) adhesion and cohesion, and (7) compatibility with repair materials. In order to insure the best possible protection from any coating material, a clean surface for application and proper priming as well as a clean application site and correct application and follow-up are necessary. Enamels, mastics, microcrystalline wax, greases, tapes, plastic films and thermosetting coatings are examples of the many types of coatings. The type of coating used varies with environmental characteristics. (Bradbeer-NWWA)
W76-00280

PLASTIC OUTFALL LAID EXTRA DEEP.
For primary bibliographic entry see Field 5E.
W76-00343

MAKING THE MOST OF ROTARY PERCUSSION BITS,
Hughes Tool Co., Houston, Tex.
For primary bibliographic entry see Field 8C.
W76-00385

AIR ROTARY DRILLING WITH ORGANIC POLYMERS OFFERS MANY BENEFITS,
Universal Oil Products Co., Denver, Colo. Johnson Div.
B. J. Reichmuth.
Johnson Drillers Journal, Vol 46, No 6, p 1-3, November-December, 1974. 3 fig.

Descriptors: *Rotary drilling, *Water wells, Ground water, Drilling fluids.
Identifiers: Organic polymer drilling fluids, *Air rotary drilling.

The properties and advantages of organic polymers in drilling fluids are discussed. In the case history discussed, shale swelling and sloughing were encountered. Since it was necessary to keep the holes open for several hours, this posed several difficult problems. Air and foarm were used with only limited success. By injecting a Revert-foam solution with the air, shale swelling and clay sloughing were eliminated. Mixed with a small quantity of water and injected with air into the borehole, Revert coats the shale particles and prevents than from absorbing the water and swelling. Hole cleaning can also be accomplished at low annular velocities and lower air delivery rates. Other advantages include extra bit lubrication and reduced downhole friction. (Campbell-NWWA)
W76-00388

CORROSION LITERATURE: SELECTED BIBLIOGRAPHY.
Ohio State Univ., Columbus. Dept. of Metallurgical Engineering.
Chemical Engineering, Vol 79, No 27, p 31-33, December 4, 1972.

Descriptors: *Corrosion, *Bibliographies, *Abstracts, Control, Inhibition, Saline water, *Corrosion control.
Identifiers: Marine environment.

An annotated bibliography lists 27 texts and handbooks that contain information and data for selection of materials to be used in a variety of environments. The references are concerned with corrosion of metals in contact with water whose quality varies from sea water to drilling muds and water to be forced into a formation to push out oil and gas. Acidic environments, refinery corrosion problems and organic and biological corrosion are covered. The effect of soils on the corrosiveness of ground water is mentioned. The process of corrosion itself is the subject of one of the references. (Bradbeer-NWWA)
W76-00393

UNDERSTANDING CORROSION,
Carpenter Technology Corp., Reading, Pa.
M. Henthorne.
Chemical Engineering, Vol 79, No 27, p 19-30, December 4, 1972. 11 fig, 10 tab.

Descriptors: *Corrosion, *Materials specifications, *Materials testing, Quality control, Specifications, Well casings, Metals.
Identifiers: Economic analysis, Materials selection.

Specifying a material of construction usually involves three stages: listing the requirements, selecting and evaluating the candidate materials, and choosing the most economical material. Typical requirements such as compatibility with existing equipment and maintainability are listed in this paper, which is part of a series of twelve on corrosion fundamentatls. The eleven basic types of corrosion are discussed and corrosion testi methods are described in detail. Corrosion cont is then discussed in relation to four differe methods (1) control of process variables (2) gineering design, (3) protection, and (4) materi selection. (NWWA-Bradbeer)
W76-00395

CORROSION CONTROL--JUST ANOTH COST.
Corrosion Engineering, St. Albert, (Alberta).
K. R. Nichol.
Canadian Mining and Metallurgical Bulletin, V 66, No 736, p 55-57, August, 1973, 1 fig, 2 ref.

Descriptors: *Corrosion control, Economi *Maintenance costs, *Variable costs, Econor justification, Feasibility, Management, Corrosi Chemical degradation, Well casings, Well scree Cost-benefit analysis, Decision making, Proj planning.
Identifiers: Discounted cash flow.

Corrosion is a constant process. Its control i necessary cost and should be incurred in the le expensive way. The Discounted Cash Fl Method of evaluating the total costs involved i workable technique. Various control measur some new, are described and include new p materials and paint testing procedures. A plan corrosion control may have six points; (1) estim the cost of losses due to corrosion, (2) determ the value of protective procedure, (3) discuss procedures with plant operators, (4) observe ma tenance practices, (5) consider the advantages consultants, and (6) decide on the actual metho control to be used. (Bradbeer-NWWA)
W76-00407

GEOLOGICAL SOCIETY ENGINEERI GROUP WORKING PARTY REPORT ON T LOGGING OF ROCK CORES FOR ENGINEI ING PURPOSES.
Geological Society of London (England).
Quarterly Journal of Engineering Geology, Vo No 1, p 1-24, December, 1970. 5 fig, 12 ref.

Descriptors: *Boreholes, *Logging(Recordir *Core logging, Geology, Core drilling, Co Driller's logs, Sampling, Methodology, Planni Application methods, Engineering geology, C engineering, Mechanical engineering, Engineer education, Geophysics.

The description of cores by logging, and meth of handling and storage are discussed. A boreh log should provide an accurate and comprehens record of the geological conditions encounte together with any other relevant information tained during drilling. The types of logs reviewed. The factors determining the logg method used such as overburden, log format, c cost benefit, and frequency are discussed. H dling, preservation and labelling are important f tors for repeated use of data. The necessary in mation is listed and includes location, drill name, state or core, descriptive geology and c sification of rocks. A proposed borehole log mat is shown in detail. (Bradbeer-NWWA)
W76-00412

THE HYDROGEOLOGICAL INVESTIGATI OF FISSURE-FLOW BY BOREHOLE LOGGI TECHNIQUES,
Geological Sciences Inst., London (England).
T. K. Tate, A. S. Robertson, and D. A. Gray.
Quarterly Journal of Engineering Geology, Vc No 3, p 195-216, February, 1970, 4 fig, 5 tab ref.

Descriptors: *Flow characteristics, *Water we *Flow measurement, *Fissures, Geology, V data, Drilling, Instrumentation, Technology, F velocity, Flowmeter, Tracking techniq Tracers, Dye, Conductivity, Temperat *Hydrogeology.

ntifiers: *Percussion wells, *Closed-circuit evision, *Borehole logging.

e instrumentation and techniques developed for investigation of fissure-flow in consolidated ifers are described and illustrated by three case tories. Physical properties of the water mea- ed are the temperature, electrical conductivity, tical velocity by flowmeter and by tracer injec- n and horizontal velocity by television equip- nt. In order to identify strata, a remote focusing sed- circuit television camera was used. Its use outlined and the implications of flow rates by lyses of the tritium contents of some water mples are considered. The case histories were at the Speen Bridge Pumping Station, Newbury in 7, (2) the Edenhall Pumping Station, late 1967, (3) the Irton Pumping Station, early 1968. adbeer-NWWA)
6-00417

LD RESULTS: NOISE-LOGGING CHNIQUE,
Cullough Services, Houston, Tex. Research Development.
S. Robinson.
roid News Bulletin, p 9-15, Spring, 1975. 7 fig.

scriptors: *Logging, *Methodology, *Borehole physics, *Leakage, Flow, Seepage, Subsur- e investigations, Oil, Gas, Oil-industry, wouts, Casing.
ntifiers: *Noise-logging, Casing failure, rehole leakage, Aquifer communication.

e noise-logging technique was introduced to the industry in 1972 and has been applied to the lo- ion of liquid or gas leaks in deep wells. The se-logging tool is a transducer that detects the chanical vibrations that produce sound and nsforms it into electric signals of alternating quency wave forms. The sensing equipment the principles of operation are described. A h noise level results from the pumping opera- n of a well and the movement of the detection ipment necessitating that the data be collected en the tool and line are stationary. Four types leaks and the associated noise-logs are ex- ned. Producing wells having channels or com- nication problems behind cemented casing, ce- nted wells that have developed channels before forating or after squeezing, wells with a history underground crossflow and blowout, and the ermination of relative flow rates from per- ated formations are discussed. (Bradbeer- WA)
6-00423

ME IN-SITU PERMEABILITY TESTS IN NDS,
crow (William) and Partners, London gland).
primary bibliographic entry see Field 8B.
6-00484

. Rapid Excavation

ACTURING IN THE ZONE AROUND A ASTHOLE, WHITEPINE, MINNESOTA,
eau of Mines, Minneapolis, Minn. Twin Cities ing Research Center.
primary bibliographic entry see Field 8B.
6-00035

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ELEVENTH ANNUAL REPORT, WATER RESOURCES RESEARCH CENTER.
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W76-00378

9D. Grants, Contracts, and Research Act Allotments

ELEVENTH ANNUAL REPORT, WATER RESOURCES RESEARCH CENTER.
Minnesota Univ., St. Paul. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 105, $4.75 in paper copy, $2.25 in microfiche. Bulletin 82, July 1975. 80 p, 25 ref. OWRT A-99-MINN(37, 14-31-0001-5023).

Descriptors: *Water resources, *Minnesota, Education, Projects, Grants, Expenditures, Manpower, Management, Water pollution, Water Resources Research Act, Universities, *Water Resources Institute, *Research and Development, Government finance, Contracts.
Identifiers: Researchers, *Applied research, *Basic research, Physical-biological-economic-social Aspects, Faculty.

The fiscal year 1975 budget of the Center was $378,584. The Center supported 12 research projects involving 9 faculty members. These research projects were concerned with: developing a water resources research plan for Minnesota; developing indices for establishing water supply quality status and trends in Minnesota; analyses of organic carbon as a pollution index in Minnesota; spatial and temporal variation of precipitation in Minnesota; forecasting rainfall and snowmelt floods; determining the geochemical and biostratigraphic record of natural and pollution eutrophication of Minnesota Lakes bio-manipulation of Minnesota lakes for elimination of blue-green algae; determining the thermal pollution and second trophic level fauna in Lake Superior; social dimensions of water quality status and trends in Minnesota; assessment of water quality status and trends in Minnesota by remote sensing techniques; and hydronomic analysis of forest management alternatives for environmental quality. About 37 students received employment through the Center's program. During fiscal year 1975, there were 26 reports generated through research projects. (Waelti-Minnesota)
W76-00378

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

WATER RESOURCES THESAURUS, SECOND EDITION, 1971.
Department of the Interior, Washington D C
For primary bibliographic entry see Field 10C.
W76-00059

10C. Secondary Publication And Distribution

WATER RESOURCES THESAURUS, SECOND EDITION, 1971.
Department of the Interior, Washington D C
Available from National Technical Information Service, Springfield, Va, 22161 as PB-245 673, $10.25 in paper copy, $2.25 in microfiche. Water Resources Scientific Information Center, 1971, 375 p.

Descriptors: *Thesauri, *Documentation, *Indexing, *Classification, *Information retrieval, Information exchange, Publications.
Identifiers: *Descriptors.

This volume is a revision of the Water Resources Thesaurus published in November 1966. It was prepared by the Smithsonian Science Information Exchange for the Water Resources Scientific Information Center, Office of Water Research and Technology. The scope of the Thesaurus encompasses the broad research areas of water resources such as the hydrologic cycle, supply and demand for water, conservation and the best use of available supplies of water, methods of increasing such supplies, and the economic, legal, social, engineering, recreational, biological, geographical, ecological, and quality aspects of water resources. These research areas are augmented by concepts important in water resources development. Over 7,000 separate changes were made to the hierarchical construction of the Thesaurus to allow for a logical embedded hierarchy of narrow terms for each descriptor. This embedded hierarchy of narrow terms was not present in the 1966 edition. The revised Thesaurus contains an alphabetical list of 4,288 approved main terms interfiled with 1,175 USE references that are intended to lead the user to the right descriptors. (OWRT)
W76-00059

INDEX TO U. S. GEOLOGICAL SURVEY COMPUTER FILES CONTAINING DAILY VALUES FOR WATER PARAMETERS TO SEPTEMBER 30, 1971, NORTHEASTERN REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 07C.
W76-00097

BIBLIOGRAPHY OF AVAILABLE GROUNDWATER INFORMATION IN OREGON,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 04B.
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PRELIMINARY ENVIRONMENTAL HAZARD ASSESSMENT OF CHLORINATED NAPHTHALENES, SILICONES, FLUOROCARBONS, BENZENEPOLYCARBOXYLATES, AND CHLOROPHENOLS,
Syracuse Univ. Research Corp., N.Y.
For primary bibliographic entry see Field 05C.
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INSTRUMENTATION AND AUTOMATION OF WASTEWATER TREATMENT SYSTEMS, (LITERATURE REVIEW),
National Environment Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W76-00364

CORROSION LITERATURE: SELECTED BIBLIOGRAPHY.
Ohio State Univ., Columbus. Dept. of Metallurgical Engineering.
For primary bibliographic entry see Field 08G.
W76-00393

10D. Specialized Information Center Services

WATER RESOURCES THESAURUS, SECOND EDITION, 1971.
Department of the Interior, Washington D C

LIBRARY U. OF I. URBANA-CHAMPAIGN

For primary bibliographic entry see Field 10C.
W76-00059

10F. Preparation Of Reviews

PRELIMINARY ENVIRONMENTAL HAZARD ASSESSMENT OF CHLORINATED NAPHTHALENES, SILICONES, FLUOROCARBONS, BENZENEPOLYCARBOXYLATES, AND CHLOROPHENOLS,
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W76-00326

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Geological Society Engineering Group Working Party Report on The Logging of Rock Cores for Engineering Purposes.
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ndex to U. S. Geological Survey Computer iles Containing Daily Values for Water arameters to September 30, 1971, Northeast-rn Region,
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round-water Levels in the United States, 968-72: Northeastern States.
W76-00098 7C

uality of Surface Waters of the United States, 969: Parts 9 and 10. Colorado River Basin and e Great Basin.
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urface Water Supply of the United States, 966-70: Part 2. South Atlantic Slope and East-n Gulf of Mexico Basins--Volume 2. Basins om Ogeechee River to Carrabelle River.
W76-00100 7C

Surface Water Supply of the United States, 1966-70: Part 12. Pacific Slope Basins in Washington--Volume 2. Upper Columbia River Basin.
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EOROLOGISCHER DIENST DER TSCHEN DEMOKRATISCHEN REPUBLIK, SDAM.
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imal Waste Impact on Recreation Waters,
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alysis of Nonpoint-Source Pollutants in the ssouri Basin Region,
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gional Distribution and Seasonal Change in cipitation Variability in Monsoon Asia,
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e of a Bioassay Test in Evaluating the Tox- y of Drilling Fluid Additives on Galveston y Shrimp,
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NESOTA UNIV., ST. PAUL. WATER OURCES RESEARCH CENTER.
venth Annual Report, Water Resources search Center.
6-00378 9D

OURI STATE DIV. OF HEALTH, ERSON CITY. BUREAU OF WATER LY.
eck Sampling for Monitoring Bacteriological ality.
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Removal of Cadmium from Waters and Wastes by Sorption on Hydrous Metal Oxides for Water Treatment,
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The Recycling of Kraft Bleach Wastes,
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On Occurrence of Similar Organisms to Gymnodinium Breve Davis in Omura Bay, (In Japanese),
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Water Balance and Water Resources In China,
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Upper Carson River Water Study, Water Year 1973,
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In Situ Hydraulic Conductivity at Four Hillslope Locations in a Closed Drainage System,
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Thermoviscoelasticity of Aging Concrete,
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Eutrophication in the Great Plains,
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Bibliography of Available Ground-Water Information in Oregon,
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Seepage in Well Systems Near a Barrier Boundary,
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Utilization of Algal Assays to Assess the Effects of Municipal, Industrial and Agricultural Wastewater Effluents upon Phytoplankton Production in the Snake River System,
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VOLUME 9, NUMBER 2
JANUARY 15, 1976

W76-00501 -- W76-01000
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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

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VOLUME 9, NUMBER 2
JANUARY 15, 1976

W76-00501 -- W76-01000

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

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Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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. WATER CYCLE

A. General

YDROLOGY FOR ENGINEERS AND PLAN-ERS,
issouri Univ., Columbia. Dept. of Civil En-neering.
. T. Hjelmfelt, Jr., and J. J. Cassidy.
wa State University Press, Ames, 1975. 210 p.

escriptors: *Hydrology, *Engineering, Hydrologic aspects, *Analytical techniques, ydrograph analysis, Hydrologic cycle, ydrologic data, Hydrographs, Unit hydrographs, ase flow, Groundwater, Flood routing, Infiltra-on, Evaporation, Precipitation(Atmospheric), eteorology, Probable maximum precipitation, atistical methods, Streamflow, Recession rves, Discharge(Water), Reservoir yield, roundwater movement, Darcys law, Water ells.

vil engineers design bridges, flood control struc-res, dams, spillways, street and highway ainage structures, channels, and water supply stems. All of these projects require quantitative drologic analysis and the judicious choice of sign events. This one semester course text book r undergraduates in hydrology provides tools for oosing design flow on the basis of combined drologic, hydraulic, and economic analysis. hapter headings are Scope of Hydrology, atistical Methods in Hydrology, Application of obability and Statistics to Selection of A Design ischarge, Precipitation, Infiltration, Streamflow, ood Routing, Reservoir Yield, Groundwater, d Evaporation. Emphasis throughout the text is the application of hydrologic principles and not on the collection of hydrologic data. lumphreys-ISWS)
76-00531

IBLIOGRAPHY OF HYDROLOGY, CANADA, 71-1973.
ternational Association of Hydrological iences, Ottawa (Ontario).
r primary bibliographic entry see Field 10C.
76-00532

YDROLOGY AND WATER RESOURCES, A YLLABUS OF REFERENCES FOR TEACHING TRODUCTORY COURSES IN THE WATER NVIRONMENT.
ational Committee for the International ydrological Decade, Washington, D.C.
r primary bibliographic entry see Field 10C.
76-00536

YDROGRAPH RECESSION CONSTANTS FOR EW SOUTH WALES STREAMS,
epartment of the Environment and Conserva-n, Canberra (Australia).
r primary bibliographic entry see Field 2E.
76-00541

HE MEDITERRANEAN OUTFLOW--A SIM-LE ADVECTION-DIFFUSION MODEL,
hode Island Univ., Kingston. Graduate School of ceanography.
r primary bibliographic entry see Field 2L.
76-00544

HE ASSESSMENT OF REGIONAL GROUND-ATER SCHEMES BY RIVER-FLOW REGRES-ON EQUATIONS,
epartment of the Environment, Reading ngland). Central Water Planning Unit.
r primary bibliographic entry see Field 4B.
76-00548

HYDROGRAPH RESPONSES TO WATERSHED MODEL SIZE AND SIMILITUDE RELATIONS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
P. E. Black, and J. W. Cronn, Jr.
Journal of Hydrology, Vol 26, No 3/4, p 255-266, August 1975. 4 fig, 4 tab, 28 ref.

Descriptors: *Hydrographs, *Model studies, *Laboratory tests, *Drainage area, *Rainfall simulators, Time of concentration, Peak discharge, Unit hydrographs, Recession curves, Rainfall intensity, Watersheds(Basins).
Identifiers: *Geomorphic parameter, Hydrologic similitude.

A study was conducted on laboratory models under a rainfall simulator to isolate the geomorphic parameter of size of the drainage basin and to determine the relationship between relative size and selected hydrograph characteristics. Three different basin sizes and two drainage patterns were modeled but the soil depth, stream and slope gradients, and drainage densities were kept unchanged. The soil was simulated by 3/8 inch thick layer of polyurethane foam featuring a variety of pore sizes. The main conclusions were: the maximum peak increases with drainage area, time of concentration increases nonlinearly with drainage area, and the time base of the hydrograph and the decay time increase with the drainage area. A comparison of model data and the real-world watersheds indicated that the extent of relationship between the models and the real-world watersheds can be expressed in terms of a factor of similitude, which is highly correlated with the drainage area. (Singh-ISWS)
W76-00549

MEANDER IRREGULARITY AND WAVELENGTH ESTIMATION,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-00550

HYDROLOGY OF THE LAKE WINGRA BASIN, DANE COUNTY, WISCONSIN.
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 2H.
W76-00667

RAINFALL-RUNOFF RELATIONS ON URBAN AND RURAL AREAS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
E. F. Brater, and J. D. Sherrill.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-046, May 1975. 97 p, 36 fig, 11 tab, 39 ref. 1BB034; ROAP 21ATB; Task 008. 11040 DRS.

Descriptors: Watersheds(Basins), Michigan, *Mathematical models, Unit hydrographs, *Runoff, *Rainfall-runoff relationships, *Cities, *Infiltration, Surface runoff, *Storm runoff, *Rural areas, *Hydrograph analysis, Urbanization.
Identifiers: Infiltration/retention, Infiltration capacity.

A procedure was developed for estimating the frequency of storm runoff of various magnitudes from rainfall and/or snowmelt on small drainage basins in various stages of urbanization. The study was based primarily on the analysis of storm runoff events on real basins varying in size from 0.02 to 734 sq mi. The method is based on applying unit hydrographs to precipitations of various frequencies after deducting infiltration and retention. A concurrent study with an analytical drainage basin model provided additional understanding of the effects of some parameters. The unit hydrograph-infiltration capacity concept was selected as the most accurate practical method for predicting storm runoff. It was found that the form of the unit hydrograph could be related to drainage basin size and degree of urbanization as measured by population density. Other characteristics of the drainage basin are much less important. The form of the unit hydrograph stays relatively constant for various durations and magnitudes of input as long as the duration of input is smaller than a critical time which can also be related to the size and population density of the basin. As the population increased from rural to highly urbanized, peak discharges for the same runoff became as much as ten times greater. Infiltration capacity was found to vary seasonally. The predicition of flood frequency by this procedure is fully operable for Southeastern Michigan. For application to other areas some hydrograph analysis must be made. (EPA)
W76-00685

RATIONAL FORMULA NEEDS CHANGE AND UNIFORMITY IN PRACTICAL APPLICATION,
For primary bibliographic entry see Field 4A.
W76-00775

THE SHORTEST TIME SEQUENCE OF HEAVY RAINFALL AND ITS EFFECT ON STORM-WATER RETENTION TANKS (DIE KUERZESTE ZEITFOLGE VON STARKREGEN UND THRE AUSWIRKUNG AUF REGENBECKEN),
R. Pecher.
Wasser und Boden, Vol 24, No 10, p 303-304, 1972. 1 fig, 9 ref.

Descriptors: *Precipitation intensity, Data collections, Design criteria, Depth-area-duration analysis, Storage capacity, Storage requirements, Storm water, Discharge(Water).
Identifiers: West Germany.

Precipitation recordings at Munich-Bavariaring over 15 consecutive summer periods were conducted in an attempt to determine the shortest time sequence of heavy rainfall and the frequency of such periods, important factors when dimensioning storm water retention basins. While this 15-year period was too short to allow conclusions on the frequency of such heavy rainfall sequences, it was found that the intervals between rainfall of relatively low intensity are usually shorter than those between high-intensity rains. It is concluded that to avoid overloading storm water retention basins, design criteria for such basins should allow for discharge of storm water loads in less than 8 to 10 hours. (Sandoski-FIRL)
W76-00798

THE UNCERTAINTIES IN SEARCH OF DESIGN PRECIPITATIONS AS INPUT DATA FOR RAINFALL-RUNOFF-MODELS (DIE PROBLEMATIK BEI DER ERMITTLUNG VON MASSGEBLICHEN NIEDERSCHLAEGEN ALS EINGANGSDATEN FUER NIEDERSCHLAG-AB-FLUSS-MODELE),
U. Maniak.
Wasser und Boden, Vol 24, No 10, p 299-303, 1972. 8 fig, 19 ref.

Descriptors: *Rainfall-runoff relationships, Data collections, Distribution patterns, *Precipitation intensity, Probable maximum precipitation, *Risks.
Identifiers: West Germany.

Data on extended heavy rainfall events of small probability, to be used as input data for rainfall-runoff models, were derived from long-term rainfall recordings in northwestern Germany. The approximate values for events of maximum precipitation in that territory were in good accordance with extrema obtained for neighboring countries. Such events have low frequency. Parametric charts for the determination of the daily rainfall for a

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specified period of time in any locality of the above territory are available with seasonal variations taken into consideration. A statistical approach to the evaluation of the territorial distribution can determine the maximum extension of heavy rainfalls. (Sandoski-FIRL)
W76-00799

ON APPLYING THE PRINCIPLE OF MAXIMUM ENTROPY TO HYDROLOGICAL PROBLEMS AND RUNOFF FORECASTING (O PRIMENENII PRINTSIPA MAKSIMUMA ENTROPPI V ZADACHAKH GIRDOLOGII I PROGNOZIROVANIYA STOKA),
For primary bibliographic entry see Field 4A.
W76-00804

ROLE OF SYNTHETIC TIME SERIES IN HYDROMETEOROLOGICAL DATA ANALYSIS,
Central and Southern Florida Flood Control District, West Palm Beach.
A. N. Shahane, D. Thomas, and P. Bock.
Water Resources Bulletin, Vol. 11, No. 4, p 770-782, August 1975. 2 fig, 5 tab, 12 ref.

Descriptors: *Time series analysis, *Synthetic hydrology, *Meteorology, *Statistical methods, *Evapotranspiration, Methodology, Hydrologic data, Stochastic processes, Analytical techniques, Hydrologic systems.
Identifiers: *Spectral analysis, *Sensitivity analysis, Stationarity, Harmonics.

The use of synthetic time series to increase confidence in the statistical parameters of limited hydrometeorological time series was investigated. A sensitivity analysis was performed to assess the effect of nonstationarity, number of lags, and small sample size on estimated spectral densities. The effects of harmonic-removal procedure on the residual series and the confidence limits in cross-spectral analysis were examined. Use of spectral analysis was found inadequate for investigating the effects of trend removal procedure on residual series. The synthetic time series analysis showed that such series were useful for selecting the proper number of lags, smoothing technique, and confidence limits. Sensitivity analysis performed on statistical variables of hydrometeorological and synthetic time series revealed the importance of proper number of lags and weights in cross-spectral analysis. Synthetic time series could be effectively used in detecting erratic behavior of the statistical parameters and in increasing confidence in the final estimates of statistical parameters. (Singh-ISWS)
W76-00891

MATHEMATICAL SIMULATION OF GROUNDWATER ABSTRACTION FROM CONFINED AQUIFERS FOR RIVER REGULATION,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W76-00904

2B. Precipitation

CLIMATE OF MINNESOTA, PART VIII--PRECIPITATION PATTERNS IN THE MINNEAPOLIS-ST. PAUL METROPOLITAN AREA AND SURROUNDING COUNTIES,
Minnesota Dept. of Natural Resources, St. Paul. Div. of Water, Soils and Minerals.
E. L. Kuehnast, D. G. Baker, and J. W. Enz.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 189, $3.75 in paper copy, $2.25 in microfiche. Tech. Bull 301, Agricultural Experiment Station, Univ. of Minn. 1975. 36 p, 25 fig, 10 tab, 11 ref. OWRT B 068-MINN (3).

Descriptors: *Minnesota, *Climates, *Precipitation(Atmospheric), *Rainfall, *Weather data, Cities, Water supply, Precipitation intensity
Identifiers: *Urban climatology, Precipitation variation, *Minneapolis-St. Paul area.

This study concentrated on the monthly, seasonal, and annual precipitation that falls within the 7,200 square mile area centered around the Twin Cities of Minneapolis and St. Paul. Records from 75 stations were available for the 14-year period 1959-1972. It was determined that the May-September station density of one per 96 square miles is sufficient to detect more than 99 percent of the summer storms of 0.01 inch or more. The total annual precipitation averaged 29.17 inches, varying from 26.96 inches at Forest Lake to 32.39 inches at Ellsworth, Wisconsin. The major forecasting and observing station within the area, MSPAP (Minneapolis-St. Paul International Airport station), averaged only 27.08 inches, or 2.09 inches below the areal mean. Areas of persistently low precipitation centered around MSPAP, with two centers of high percipitation located to the north-northwest and northeast of MSPAP in Hennepin and Washington Counties, respectively. The higher precipitation amounts in these two areas were limited to the May-September period. The differences in precipitation amounts between stations in high and low regions were found to be statistically valid. High precipitation areas are explained by the occurrence of low level moisture convergence zones that result from a combination of local topography, summertime convective activity, and the surface winds at the time of precipitation. Tornado paths within the area were shown to apparently prefer paths or alleys that more or less coincide with the orientation and location of the high precipitation areas. (See also W75-10009)
W76-00504

RAINFALL MEASUREMENTS ABOVE AND IN THE CANOPY OF A MIXED OAK FOREST,
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.
G. Schnock.
Oecol Plant. Vol 8, No 1, p 17-23. 1973. (English summary).

Descriptors: *Rainfall, Precipitation(Atmospheric), *Measurement, Forests, Oak trees, Rain gages, Canopy, *Throughfall.
Identifiers: Hornbeam, Oak, Belgium.

Measurement of total rainfall above the canopy shows that in all the cases known at present, the sizes of water collected at this level are always lower than those measured in the open on a near plot (meadow). Differences are essentially dependent of the wind speed, the model of rain gauge and the canopy roughness. With 3 shelterless rain gauges fixed at 5 m above the canopy, at the level of crowns and in a small opening into the limbs, 93.9, 94.7 and 97.6%, respectively, of total rainfall collected in open during a 10 mo. period was obtained. In an oak-hornbeam forest the deficit observed for a 14 mo. period reaches 21%. Throughfall and interception loss calculations for the mixed oakforest of Virelles (Belgium) with these different values lead to an overestimation of throughfall (8.4-11.7%) and an underestimation of interception (9.1-12.7%).--Copyright (c) 1974, Biological Abstracts, Inc.
W76-00583

THE SHORTEST TIME SEQUENCE OF HEAVY RAINFALL AND ITS EFFECT ON STORMWATER RETENTION TANKS (DIE KUERZESTE ZEITFOLGE VON STARKREGEN UND THRE AUSWIRKUNG AUF REGENBECKEN),
For primary bibliographic entry see Field 2A.
W76-00798

THE UNCERTAINTIES IN SEARCH OF DESIGN PRECIPITATIONS AS INPUT DATA FOR RAINFALL-RUNOFF-MODELS (DIE PROBLEMATIK BEI DER ERMITTLUNG VON MASSGEBLICHEN NIEDERSCHLAEGEN ALS EINGANGSDATEN FUER NIEDERSCHLAG-ABFLUSS-MODELE),
For primary bibliographic entry see Field 2A.
W76-00799

PERFORMANCE CHARACTERISTICS OF 'BULK EFFECT' HUMIDITY SENSORS,
National Bureau of Standards, Washington, D. C. Mechanics Div.
For primary bibliographic entry see Field 7B.
W76-00886

ROLE OF SYNTHETIC TIME SERIES IN HYDROMETEOROLOGICAL DATA ANALYSIS,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 2A.
W76-00891

PRECIPITATION: ITS ACIDIC NATURE,
Pittsburg Univ., Pa. Dept. of Occupational Health.
For primary bibliographic entry see Field 2K.
W76-00900

RETARDATION OF CONDENSATION NUCLEI GROWTH BY SURFACTANT,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
J. Podzimek, and A. N. Saad.
Journal of Geophysical Research, Vol 80, No 24, p 3386-3392, August 20, 1975. 7 fig, 1 tab, 53 ref, 1 append. ONR N00014-69-A-0141-0005; NSF GA-36041.

Descriptors: *Condensation, *Drops(Fluids), *Surfactants, Model studies, Mathematical models, Monomolecular films, Chemicals, Alcohols, Retardants, Fog, Clouds, Particle size, Laboratory tests, Cloud physics, Meteorology.
Identifiers: *Drop growth, Cetyl alcohol, Cloud models.

A one-dimensiona cloud model was used to show how the coverage of droplets by surfactant films can suddenly change the growth of certain sizes of drops in a cloud drop spectrum. The retarded or accelerated growth depends upon the nature and thickness of the surfactant film, the size of the nuclei, and the cooling rate of the air parcel. The model also indicated some possibilities of how to influence the development of cloud drop spectra that grow on a specific type of nuclei. Small nuclei, which might greatly outnumber the large ones, can be quickly activated, and thereby a cloud or fog will become colloidally unstable. However, the final effect depends strongly upon the assumptions made for the distribution of a surfactant among different sizes of nuclei. (Sims-ISWS)
W76-00908

WEATHER MODIFICATION LAW DEVELOPMENTS,
Arizona Univ., Tucson.
R. J. Davis.
Oklahoma Law Review, Vol 27, No 3, p 409-439, 1974. 208 ref.

Descriptors: *Cloud seeding, *Artificial precipitation, *Artificial storms, *Weather modification, Droughts, Precipitation(Atmospheric), Administrative decisions, Contract administration, Water demand, Water rights, Project planning, Legislation, Penalties(Legal), Regulation, Administrative agencies.
Identifiers: *Environmental Impact Studies, *Agricultural community, *Weather control

ms, *Supplemental waters, Injunctive relief, bying.

re is a developing body of statutory adminis- ive, and case law concerning weather modifi- on activities. Cloud seeding is used to aid cultural recreational businesses by making rain preventing hailstorms. This technique is con- versial, however, because of the adverse side- cts such as flooding which may occur. In the ence of statute, courts have refused to charac- ze cloud seeding as an extra-hazardous activi- and persons seeking damages must prove ac- damage and tortious conduct. There is a trend ards administrative rather than judicial resolu- of conflicts. At least 31 states have statutes ch deal with weather modification in some n. The general pattern is to authorize an agency regulate cloud seeding. The prevalent niques are registration of proposed projects, rational and professional licensing, govern- tal contracts for cloud seeding and public in- vement. Several states authorize agencies to oin illegal weather modification activities. In area of atmospheric water rights, the common riparian rights doctrine would deny a cloud der access to water caused by the seeding un- he owned land bordering on a supplemental er source. Only Colorado and Utah have cted laws recognizing that a landowner may ap- priate atmospheric water. The most recent slation emphasizes the environmetnal impact weather control. The federal government has n most active in this area, particularly in fund- pilot projects to test the long range effects of id seeding. Cloud seeding is currently hibited in federal wilderness areas. This limited eral involvement in regulation of weather con- will expand as seeding proposals take on intra- e and international importance. (Jenkins- rida)
6-00923

VIRONMENTAL LAW: WEATHER MODIFI- TION-PROPOSED FEDERAL LEGISLATION D THE OKLAHOMA WEATHER MODIFI- TION ACT,
primary bibliographic entry see Field 6E.
6-00928

. Snow, Ice, and Frost

MPRESSIBILITY CHARACTERISTICS OF DISTURBED SNOW,
ld Regions Research and Engineering Lab. nover, N.H.
Abele, and A. J. Gow.
search Report 336, May 1975. 57 p, 14 fig, 1 tab, f, append.

scriptors: *Snow, *Compressibility, mpressive strength, *Mechanical properties, ysical properties, Trafficability, Ice, Crystal- tion, Crystals, Crystallography, Glaciers, ess, Density, Deformation, Compaction, ength of materials, Temperature, Laboratory ts, Cold regions.

e effects of snow temperature, rate of deforma- n, and initial density on the stress vs. density l stress vs. deformation relationships were in- tigated in the pressure range of 0.1 to 75 bars. e rate of deformation in the range of 0.027 to 27 /sec did not have a significant effect. A rease in temperature in the range of 0 to -40 grees C increased the resistance to stress and ormation, the temperature effect increasing h applied pressure and initial density. The ef- t of initial density was significant. For any ess, an increase in the initial density resulted in increase in the resulting density, particularly at stress levels and at temperatures near 0 grees C. The texture of artificially compacted ow was significantly different from that of natu- y compacted snow of the same density because of the very short recrystallization time period. (Sims-ISWS)
W76-00537

FLOATING ICE THICKNESS AND STRUCTURE DETERMINATION--HEATED WIRE TECHNIQUE,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
R. O. Ramseier, and R. J. Weaver.
Environment Canada, Technical Bulletin 88, 1975. 16 p, 10 fig, 8 ref, 2 append.

Descriptors: *Ice, *Measurement, *Instrumentation, Lake ice, Sampling, Equipment, Gages, On-site data collections, Data collections.
Identifiers: *Floating ice, *Ice thickness, River ice, Ice measurement, Heated wire technique.

The thickness of floating ice is one of the most important general parameters to be measured for many applications in the fields of transportation, engineering and climatology. The requirement for accurate thickness information, with details on the ice structure, led to the development and use of the heated wire ice thickness gage. Once installed, the gage provides a means of making in-situ thickness measurements on fresh and salt water ice quickly and accurately. The measurement methods of determining ice structure from readings obtained were described, along with details of construction of the gage complete with engineering drawings. (Sims-ISWS)
W76-00884

ON THE ORIGIN OF PINGOS,
Vrije Universiteit, Amsterdam (Netherlands). Earth Sciences Inst.
H. Ryckborst.
Journal of Hydrology, Vol. 26, No. 3/4, p 303-314, August 1975. 4 fig, 16 ref.

Descriptors: *Permafrost, *Frozen soils, *Arctic, *Canada, Cold regions, Frost heaving, Soil mechanics, Hydrology, Ice, Tundra, Surface tension, Capillary action, Heat flow.
Identifiers: *Pingos, *Ice lenses, *Tuktoyaktuk peninsula(Canada).

Pingos on the Tuktoyaktuk peninsula, Northwest Territories, Canada, originate as upward-growing ice lenses above the water table in the active layer in sand whose pF value exceeds unity and is therefore unsaturated. The lenses grow at the base at a rate of 50-300 mm/yr, thus lifting the entire lens and overburden. They melt partially at the top (10-30 mm/yr) during the short arctic summer (100 days). Thin ice lenses, up to about 0.12 m, develop quite rapidly in sandy soils in a period of one winter. The intermediate lenses up to 14 m may grow in silty soils in a period of 75 years, whereas the slowly growing thick ice lenses such as pingos of 60 m require almost a millenium to develop. Pingos grow in areas of abundant water supply, e.g., ground-water-discharge areas. Under severe periglacial conditions the long-term average annual air temperature of -10C ensures a restricted summer melt of 10-30 mm/yr. This gives the pingo ice lens, which grows at the base at a rate of 50 mm/yr, a chance to develop slowly. The controlling factors for the growth of a pingo are the overburden pressure and the presence of a thin silt or clay lens embedded in the partly saturated sand at the pingo base. The silt or clay lens prevents the downward penetration of the growing ice lens and yet allows an upward water flow of 0.25 mm/day to exist. It is not likely that pingos will grow beyond a height 0f 60-70 m. (Sims-ISWS)
W76-00899

A DRAG PARTITION THEORY FOR DETERMINING THE LARGE-SCALE ROUGHNESS PARAMETER AND WIND STRESS ON THE ARCTIC PACK ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
S. P. S. Arya.
Journal of Geophysical Research, Vol. 80, No. 24, p 3447-3454, August 20, 1975. 6 fig, 1 tab, 22 ref. NSF DES74-00964 A01.

Descriptors: *Ice, *Ice cover, *Arctic, *Model studies, Mathematical models, Sea ice, Drag, Stress, Boundary layers, Wind pressure, Cold regions, Arctic Ocean, Theoretical analysis.
Identifiers: *Roughness parameter(Ice), Drag partition.

A simple drag partition theory was developed for the classical problem of boundary layer flows over regular arrays of two- or three-dimensional roughness elements. The theoretical expression for the ratio of the form drag on these elements to the total drag was shown to be in good agreement with wind tunnel observations. It was used for determining the contribution of form drag on pressure ridges to the total wind stress on the arctic pack ice. The theory also lead to an expression for the large-scale roughness parameter as a function of mean ridge height, ridging intensity, small-scale or local roughness parameter, and an average form drag coefficient. It was required for determining the average wind stress over large areas of the Arctic on a routine basis, using the so-called geostrophic drag method, as invisaged in the Aidjex program. (Sims - ISWS)
W76-00909

ENVIRONMENTAL LAW: WEATHER MODIFICATION-PROPOSED FEDERAL LEGISLATION AND THE OKLAHOMA WEATHER MODIFICATION ACT,
For primary bibliographic entry see Field 6E.
W76-00928

2D. Evaporation and Transpiration

A THEORY FOR LOCAL EVAPORATION (OR HEAT TRANSFER) FROM ROUGH AND SMOOTH SURFACES AT GROUND LEVEL,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
W. Brutsaert.
Water Resources Research, Vol 11, No 4, p 543-550, August 1975. 7 fig, 40 ref.

Descriptors: *Evaporation, *Heat transfer, Atmosphere, Humidity, Shear, Turbulent flow, Eddies, *Model studies, Surface tension, Theoretical analysis, Interfaces, *Diffusion, Diffusivity, Drag, Shear stress.
Identifiers: *Similarity models, Turbulent transfer, Surface sublayer, Dimensionless parameters, Dalton number, Prandtl number, Surface roughness, Interfacial sublayer, Dynamic sublayer.

A model proposed in 1965 for evaporation as a molecular diffusion process into a turbulent atmosphere was extended by joining it with the similarity models for turbulent transfer in the surface sublayer. The assumed mechanisms were suggested by available flow visualization studies near smooth and rough walls; the theoretical result was in good agreement with available experimental evidence. The important dimensionless parameters governing the phenomenon near the surface were the Dalton (or Stanton) number (i.e., mass transfer coefficient), the drag coefficient, the roughness Reynolds number (except for smooth surfaces), and the Schmidt (or Prandtl) number. The proposed formualtion allowed the evaluation of the effects of some parameters, such as surface roughness or molecular diffusivity, that were not well understood before this. An importnat practical result was that, in contrast to the drag coefficient, the Dalton number is relatively insensitive to changes in roughness length. (Roberts-ISWS)

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W76-00560

EVAPOTRANSPIRATION BY PHREATOPHYTES IN THE NORTH PLATTE BASIN OF WYOMING,
Wyoming Univ., Laramie. Water Resources Research Inst.
R. W. VanKlaveren, L. O. Pochop, and W. E. Hedstrom.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 194, $3.75 in paper copy, $2.25. Water Resources Series No 56, June 1975. 27 p, 5 fig, 8 tab, 17 ref. Partial completion report. OWRT A-014-WYO(2). 14-31-0001-5051.

Descriptors: *Phreatophytes, *Evapotranspiration, *Wyoming, Cottonwoods, Willow trees, Rivers, River basins, Vegetation, Tributaries.
Identifiers: *North Platte River Basin(Wyo), Laramie River(Wyo), Medicine Bow(Wyo), Sweetwater River(Wyo).

A survey of phreatophyte vegetation and its water usage was conducted for the North Platte Basin of Wyoming. The study was limited to the phreatophyte vegetation along the North Platte River and its three main tributaries: the Laramie, Medicine Bow, and Sweetwater Rivers. An estimated 90 to 95% of the phreatophytes were either cottonwoods or willows. Long-term annual average evapotranspiration rates of .94, .81, and .67 m for high, medium, and low density vegetation, respectively, were estimated using the Blaney-Criddle method. The total estimated long-term annual evapotranspiration was 8,121 hectare-meters for the four major rivers in the North Platte Basin of Wyoming.
W76-00673

ESTIMATING EVAPORATION: A TECHNIQUE ADAPTABLE TO REMOTE SENSING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, R. D. Jackson, and R. J. Reginato.
Science, Vol 189, No 4207, p 991-992, September, 1975. 3 fig, 7 ref.

Descriptors: *Evaporation, *Climatic data, *Estimating, *Soil surfaces, *Water loss, *Remote sensing, Model studies, Physical properties, Climatology, Solar radiation, Temperature, Water balance, Arid lands, Air temperature, Synthetic hydrology, Mathematical models, Thermal properties, Albedo, Air-earth interfaces, Soil temperature, Soil moisture, *Arizona.
Identifiers: Avondale loam, *Phoenix(Ariz).

A procedure given for calculating 24 hour totals of evaporation from wet and drying soils uses the following information: the daily solar radiation, maximum and minimum air temperatures, moist surface albedo (readily estimated or obtainable from a one-time measurement), and maximum and minimum surface temperatures (obtainable from surface or airborne sensors). Tests of the method on a bare field of Avondale loam at Phoenix, Arizona, have shown success regardless of season. (Robinett-Arizona)
W76-00701

EVAPOTRANSPIRATION,
Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.
C. A. Federer
Reviews of Geophysics and Space Physics, Vol 13, No 3, p 442-445, 487-494, July, 1975. 238 ref.

Descriptors: *Evapotranspiration, Climatology, Environmental effects, Evaporation, Lysimeters, Soil moisture, Stomata, Transpiration, Water loss, Water vapor, Plant physiology, Turgidity, Water balance, Tracers, *Bibliographies.
Identifiers: Penman's equation, Monteith's equation.

The principal goal of evapotranspiration (ET) research is to find methods for calculating the value of ET under any given conditions. This study centers on ET as a physiologically controlled process, emphasizing stomatal behavior. Penman's equation is discussed along with water potential, water availability, and ET model systems. ET measurement by tracer techniques, lysimeters, and the Bowen ratio, is briefly discussed, and an analysis with Monteith's equation is included. Methods are needed for estimating watershed ET that are based on an understanding of the physics and physiology of evapotranspiration, not on soil moisture conditions. (Robinett-Arizona)
W76-00702

INFLUENCE OF SOIL-WATER POTENTIAL ON THE WATER RELATIONSHIPS OF HONEY MESQUITE,
Texas State Technical Institute, Amarillo.
S. J. Easter, and R. E. Sosebee.
Journal of Range Management, Vol 28, No 3, p 230-232, May, 1975. 3 fig, 32 ref.

Descriptors: *Soil moisture, *Plant physiology, *Semiarid climates, *Water loss, *Water requirements, Moisture tension, *Texas, Moisture availability, Moisture content, Moisture deficit, Soil-water-plant relationships, Desert plants, Range management, Plant growth, Mesquite, Hygrometry, Irrigation effects, Moisture stress, Transpiration, Plant growth.
Identifiers: Lubbock(Tex), Soil water potential, *Honey Mesquite(Prosopis glandulosa Torr. var. glandulosa).

Thermocouple psychrometry was used to measure soil and plant water potentials of honey mesquite growing under irrigated and nonirrigated field conditions. Irrigated trees showed more internal stress (Average minimum water potential=-30.9 bars) than nonirrigated trees (average minimum water potential=-19.4 bars). Water potential and transpiration rates adhered to a very distinct daily pattern with minimum water potential occuring at about noon in the trees growing on both sites. During the growing season, the average transpiration rate for irrigated trees was 0.0000959 grams/sq cm-minute, and .0000715 grams/sq cm-minute for nonirrigated trees. Irrigated trees produced 2 times the foliage of nonirrigated trees and had the greatest amount of soil water depletion. Results indicate that water loss in honey mesquite growing in upland sites or in shallow soils (relatively dry areas) is less than the amount lost from trees growing on bottomland and riparian sites. (Robinett-Arizona)
W76-00703

DROUGHT TOLERANCE OF PINE SEEDLINGS UNDER VARIOUS CLIMATIC CONDITIONS,
Agricultural Research Organization, Dor (Israel). Div. of Forestry.
For primary bibliographic entry see Field 2I.
W76-00712

THE INFLUENCE OF LOCAL ADVECTION ON EVAPO-TRANSPIRATION FROM IRRIGATED RICE IN A SEMI-ARID REGION,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
A. R. G. Lang, G. N. Evans, and P. Y. Ho.
Aricultural Meteorology, Vol 13, No 1, p 5-13, January, 1974. 3 fig, 1 tab, 18 ref.

Descriptors: *Lysimeters, *Evapotranspiration, *Moisture content, *Advection, Australia, Semi-arid climates, Irrigation, *Rice, Radiation, Newport, Evaporation.

In a semi-arid region, evapotranspiration from a flood-irrigated rice crop was determined with lysimeters at distances of 15, 60, 290 and 790 m. downwind from the edge. The expression $E = ax(-p+b$ gave the most consistent results. This indicates, in theory, that evapotranspiration can be measured from any position in the field. The study demonstrated that for practical purposes a correction for advection must be applied if the measurement was taken at the center of the field. (McLachlin-Arizona)
W76-00713

DIFFERING SENSITIVITY OF CORN AND SOYBEAN PHOTOSYNTHESIS AND TRANSPIRATION TO LEAD CONTAMINATION,
Illinois Univ., at Urbana-Champaign
For primary bibliographic entry see Field 5B.
W76-00720

EFFECT OF TRANSPIRATION RATE ON SALT ACCUMULATION AROUND CORN ROOTS IN A SALINE SOIL,
Punjab Agricultural Univ., Ludhiana, India. Coll. of Agricultural Engineering.
For primary bibliographic entry see Field 3C.
W76-00827

COUPLING OF ENVIRONMENT TO PLANT RESPONSE: A SIMULATION MODEL OF TRANSPIRATION.
Washington State Dept. of Natural Resources, Olympia. Forest Land Management Center.
K. L. Reed, and R. H. Waring.
Ecology. Vol 55 No 1: p 62-72. 1974 Illus.

Descriptors: *Transpiration, Ecosystems, Model studies.
Identifiers: Douglas fir.

A low-resolution simulation model of transpiration was developed and run, with data from field studies in southwestern Oregon (USA). The output of the model served as a means of relating environmental variables to plant response. This relation was used to define an ordinate which, in conjunction with previously developed ecosystem ordinates, proved helpful for comparing ecosystems, predicting community composition and, in special cases, growth. The data requirements of the model are modest; we deliberately developed a model that can be used on data obtained from field studies where electric power is unavailable and use of sophisticated instrumentation is impossible. The model requires inputs of air and soil temperature, atmospheric humidity, seasonal plant water potential (expressed as plant moisture stress, the absolute value of plant water potential), and a model of stomatal behavior. Where it was impossible to obtain accurate data, stochastic models were used to provide the necessary input. The model simulated both potential and actual transpiration, the ratio of which is the most valuable single index of the seasonal moisture regime. Where no measurable stomatal control was exerted by Douglas-fir, the ratio was 1.0, indicating that adequate water was available to meet the transpiration demand. The ratio approached 0.3 on the drier locations. Significant changes in vegetation and growth were associated with this index.--Copyright 1974, Biological Abstracts, Inc.
W76-00902

2E. Streamflow and Runoff

HYDROLOGY FOR ENGINEERS AND PLANNERS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-00531

HYDROGRAPH RECESSION CONSTANTS FOR NEW SOUTH WALES STREAMS,
Department of the Environment and Conservation, Canberra (Australia).

Klaassen, and D. H. Pilgrim.
ril Engineering Transactions, The Institution of gineers, Australia, Vol CE17, No 1, p 43-49, 5. 7 fig, 5 tab, 23 ref.

scriptors: *Recession curves, *Hydrograph lysis, *Floods, *Surface runoff, *Subsurface w, *Base flow, *Watersheds(Basins), *Surface-undwater relationships, *Australia, Histo-ms, Geology, Hydrology, Streams, Overland w.
ntifiers: *New South Wales.

ily recession constants of surface runoff, inter-w, and baseflow have been derived for 150 ods on 29 New South Wales catchments with as larger than 250 sq km. Variations of in-pretation by different analysts were shown to e a significant effect on the surface runoff ues. For the three flow components, significant ferences in recession constant values were nd between coastal and inland catchments, and se correspond with broad-scale geological racteristics. Regional median values of eflow and interflow recession constants were ived for use in design. Satisfactory relation-ps between recession constants and geological l physical characteristics of individual chments could not be found, but tentative rela-ns were presented. Published recession data m overseas were found to be comparable with New South Wales data. Derived maximum eflow and interflow discharges should provide seful adjunct to the derived recession constants interpretation of recessions and low flow racteristics. (Lardner-ISWS)
6-00541

DROGRAPH RESPONSES TO WATERSHED ODEL SIZE AND SIMILITUDE RELATIONS,
te Univ. of New York at Syracuse. Coll. of En-onmental Science and Forestry.
r primary bibliographic entry see Field 2A.
6-00549

CANDER IRREGULARITY AND AVELENGTH ESTIMATION,
ll Univ. (England). Dept. of Geography.
I. Ferguson.
rnal of Hydrology, Vol 26, No 3/4, p 315-333, gust 1975. 10 fig, 3 tab, 22 ref.

scriptors: *Meanders, *Geomorphology, avelengths, Europe, *Rivers, River systems, er beds, Channel morphology, Channels, annel erosion, Width, Dishcharge(Water), eamflow, Streambeds, Variability.
ntifiers: *Meander bends, *Meander irregulari-Direction spectra, British river systems, Au-orrelograms, Spectral analysis, Meander scale.

n-uniformity of local environmental conditions ds to differences in the axial orientation, length, l degree of development of individual meander ds, so that rivers vary in meander irregularity well as in sinuosity and dominant wavelength. velength estimation is therefore necessarily listical; various methods were compared for 19 tish river reaches digitized as direction series. r a given reach, mean bend length was strongly endent on the sampling interval over which h direction measurement was made. Direction ctra were not significantly polymodal, in con-st to Speight's finding,s but dominant velengths were high or infinite because of val-bends. Better wavelength estimates were ob-ed from direction-change spectra, whose sin-peaks are not systematically affected by the ice of sampling interval; lack of resolution can partly overcome by averaging estimates for dif-ent sampling intervals. Direction and direction-nge autocorrelograms were generally of nped oscillatory form, and wavelengths esti-ted from direction-change autocorrelations cor-ated closely with spectral estimates. Both velengths were nearly linearly related to chan-nel width and the square root of 1% duration discharge, irrespective of flow variability, width/depth, ratio or slope. (Lee-ISWS)
W76-00550

SHEAR DISTRIBUTION IN BENDS IN RECTANGULAR CHANNELS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 8B.
W76-00552

THE SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 4. ST. LAWRENCE RIVER BASIN--VOLUME 1. BASINS OF STREAMS TRIBUTARY TO LAKES SUPERIOR, MICHIGAN, AND HURON,.
Geological Survey, Reston Va.
For primary bibliographic entry see Field 7C.
W76-00651

EVALUATION OF EFFECTS OF LAND-USE CHANGES ON STREAMFLOW,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W76-00657

FLOOD-HAZARD STUDY--100-YEAR FLOOD STAGE FOR APPLE VALLEY DRY LAKE, SAN BERNARDINO COUNTY, CALIFORNAI,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4A.
W76-00659

A HYDROLOGIC ASSESSMENT OF THE SEPTEMBER 14, 1974, FLOOD IN ELDORADO CANYON, NEVADA.
Geological Survey, Reston, Va.
P. A. Glancy, and L. Harmsen.
Available from Supt. of Documents, GPO, Wash, DC, 20402, price $1.15. Professional Paper 930, 1975. 28 p, 28 fig, 5 tab, 9 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *Sediment transport, *Nevada, Streamflow, Flow rates, Peak discharge, Hydrologic data, Runoff, Storms, Evaluation.
Identifiers: *Eldorado Canyon(Nev).

A devastating flash flood of thunderstorm origin struck Eldorado Canyon, a 22.9 sq mi drainage with a history of flooding, in southern Nevada, at about 2:30 p.m., September 14, 1974. The flood killed at least 9 people, destroyed 5 trailer homes and damaged many others, obliterated a restaurant, destroyed 38 vehicles, 19 boat trailers, 23 boats, half of the boat-docking facilities, and the gas dock. The severe runoff resulted from intense basinwide rain and hail at rates up to 3 inches of precipitation per half an hour. Peak discharge was estimated to be 76,000 cfs just upstream from the developed area near the canyon mouth. About 2,000 acre-ft of runoff reached Lake Mohave, the canyon terminus. Runoff dumped an estimated 70,000 cu yd (about 100,000 tons) of inorganic sediment on Lake Mohave and throughout the lowermost canyon reach. It also delivered an estimated 4 acre-ft of organic or floating debris to Lake Mohave. The inorganic sediment was estimated to be less than 1 percent boulders, 40 to 60 percent gravel, 20 to 40 percent sand, and 10 to 25 percent silt-clay. (Woodard-USGS)
W76-00663

MAP SHOWING FLOOD-PRONE AREAS, COLORADO SPRINGS-CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-00668

HYDROLOGIC UNIT MAP--1974, STATE OF NORTH CAROLINA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00670

HYDROLOGIC UNIT MAP--1974, STATE OF FLORIDA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00671

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN -- FOREST HYDROLOGY MODEL,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 4D.
W76-00672

RELATIONSHIP OF DURATION OF FLOWS AND SELECTED WATERSHED PARAMETERS TO THE STANDING CROP ESTIMATES OF TROUT POPULATIONS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W76-00674

FLOW ESTABLISHMENT AND INITIAL ENTRAINMENT OF HEATED WATER SURFACE JETS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5B.
W76-00679

SIMULATION OF GAMMA-DISTRIBUTED FIRST-ORDER MARKOV CHAIN,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
V. Klemes, and L. Boruvka.
Water Resources Research, Vol 10, No 1, p 87-91, February, 1974. 1 fig, 1 tab, 9 ref.

Descriptors: *Markov processes, *Simulation analysis, Hydrology, Mathematical studies, Mathematics.
Identifiers: *Markov chain, *Gamma distribution.

Simulation of a serially correlated series with a given marginal distribution is one of the important prerequisites of synthetic hydrology and of its applications to analysis of water resource systems. The problem has, however, no fully satisfactory solution because of the difficulties in defining other than normal multivariate distributions. The gamma-distributed first-order Markov chain is one of the most useful models of this category, since marginal distributions of many hydrologic variables can be approximated satisfactorily by the gamma distribution, and the limited understanding of the sequential behavior of the process combined with the smallness of available data samples often does not warrant models more sophisticated than the first-order Markov chain. (Skogerboe-Colorado State)
W76-00743

THE 1973 FLOOD AND MAN'S CONSTRICTION OF THE MISSISSIPPI RIVER,
Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
For primary bibliographic entry see Field 4A.
W76-00901

PROPERTY--CLASSIFYING BODIES OF WATER AS LAKES OR STREAMS,
W. M. Schultz, Jr.
Tulane Law Review, Vol 49, p 208-213, 1974. 41 ref.

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Descriptors: *Classification, *Judicial decisions, *Legislation, *Lakes, *Streams, Bodies of water, Lake shores, Streamflow, Legal aspects, High water mark, Banks, Low water mark, Accretion(Legal aspects), Boundaries(Property), Currents(Water), Louisiana, Public rights, Adjacent land owners, Properties, Size, Shape, Depth, Public lands.
Identifiers: *Grand Lake, *Six Mile Lake, *State ownership, Legal test.

The Louisiana Supreme Court in State v. Placid Oil Co., articulated the legal test for classifying a body of water as a lake or stream. In Louisiana the state ceded ownership of the banks, or land between the ordinary high and low water marks, of navigable rivers and streams to the adjacent landowners. Regarding lakes, however, the state retained ownership of all lands below the ordinary high water mark. The issue in this case was ownership of a segment of the bank of a water body which turned on the question of whether the body of water was a stream or a lake. In prior cases the Louisiana courts had applied either an 'expanse of size' test or an 'alluvionforming current' test. The Supreme Court in the Placid Oil test merged the two tests and incorporated several additional elements to arrive at a multiple factor test. The test includes the size, shape, depth and current of the body of water. The multiple factor test will give the courts more freedom to weigh the public interest in the land when determining ownership. (Altuve-Florida)
W76-00931

THE VARIATION OF DISSOLVED CONSTITUENTS WITH DISCHARGE IN SOME NORFOLK RIVERS,
Yorkshire River Authority, Leeds (England) Pollution Prevention Dept.
For primary bibliographic entry see Field 5B.
W76-00991

DISSOLVED LOAD AND TENTATIVE SOLUTE BUDGETS OF SOME NORFOLK CATCHMENTS,
Yorkshire River Authority, Leeds (England). Pollution Prevention Dept.
For primary bibliographic entry see Field 5B.
W76-00992

2F. Groundwater

A GEOPHYSICAL METHOD FOR DETERMINATION OF AQUIFER PARAMETERS OF HARD ROCKS,
Central Water and Power Research Station, Poona (India).
M. Bardhan.
In: International Symposium on Development of Ground Water, November 26-29, 1973, Madras, India, Vol 1, pIb-11-Ib-21, 2 fig, 1 tab, 7 ref.

Descriptors: *Aquifer characteristics, *Aquifers, *Groundwater, Geophysics, Borehole methods, Logging(Recording), Tracers, Locating, Movement.
Identifiers: *Hard rock aquifers, Gamma-gamma logging, Neutron-neutron logging, Density logging.

Any geophysical method capable of giving all the essential aquifer parameters, namely porosity, permeability, transmissibility and specific yield, has to be a combination of techniques. In this model the objective is obtained through a tricomponent system, consisting of (1) gamma-gamma logging t delineate hard rock aquifer zones, (2) neutron-neutron logging to confirm these zones and determine their porosity, and (3) observation of the dilution of an injected tracer in the aquifer zone to determine the rate of ground water flow through them, from which the permeability and transmissability of the individual aquifers are determined. In gamma-gamma logging the quantum of measured gamma rays scattered by the formation can be translated in terms of bulk density of the medium logged. Hard rock aquifers show a lower value of bulk density. The neutron-neutron moisture logging detects the concentration of hydrogen in the formation. Thus the water table is easily located. Below the water table the measured values correspond to the effective porosity of the formation with hard rock aquifers exhibiting higher porosity than the unfractured massive rocks. Formulas for determining the flow rate in an aquifer from concentrations of dye in a formation through time have been developed. Field studies of this method have been made and the results at Kusuma dam site of the Bansagar Project, Madhya Pradesh, India are reported. The accuracy of the method is dependent on certain specific geostructural and geohydrologic conditions such as fracturing and its orientation, and is discussed. (Bradbeer-NWWA)
W76-00529

WATER RESOURCES OF HANCOCK COUNTY WITH EMPHASIS ON GROUND-WATER AVAILABILITY,
Indiana Dept. of Natural Resources, Indianapolis. Div. of Water.
For primary bibliographic entry see Field 7C.
W76-00534

A HELE-SHAW MODEL STUDY OF STEADY STATE FLOW IN AN UNCONFINED AQUIFER RESTING ON A SLOPING BED,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Agricultural Engineering.
C. S. Jaiswal, and H. S. Chauhan.
Water Resources Research, Vol 11, No 4, p 595-600, August 1975. 4 fig, 1 tab, 7 ref.

Descriptors: *Model studies, *Groundwater movement, *Slopes, *Seepage, Aquifers, Aquicludes, Water table aquifers, Equations, Height, Groundwater, Viscosity, Theoretical analysis, Steady flow.
Identifiers: *Hele-Shaw models, Sloping aquifers.

Experiments were conducted on a vertical Hele-Shaw model to study the effect of slope of an impermeable layer on flow profiles and flow rates in an unconfined aquifer. Experimental results were compared with the solutions of Pavlovsky (1930) and Childs (1971).for nonuniform seepage on a small sloping impermeable bed .These studies showed that the solution of Pavlosky may be used for the prediction of the flow profile downslope up to 30% slope and upslope up to 15% slope. Pavlosky's equations also predicted flow rates and normal depths satisfactorily up to 30% slope. Child's equations also predicted similar results. None of these equations predicted the flow rate on negative slope satisfactorily. (Visocky-ISWS)
W76-00540

THE ASSESSMENT OF REGIONAL GROUND-WATER SCHEMES BY RIVER-FLOW REGRESSION EQUATIONS,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-00548

GROUND-WATER RECHARGE SIMULATION,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
A. C. Amar.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY9, Paper 11588, p 1235-1247, September 1975. 6 fig, 17 ref, 2 append.

Descriptors: *Groundwater recharge, *Simulation analysis, *Leplaces equation, *Dupuit-Forchheimer theory, *Potential flow, Groundwater, Mathematics, Equations, Unsteady flow, Recharge, Artificial recharge, Saturated flow, Numerical analysis, Mathematical studies, Free surfaces, Model studies
Identifiers: *Groundwater mounds, *Type curves, *Finite difference formulation

Formulation and solution of a two-dimensional nonlinear computational model based on potential theory pertaining to a typical groundwater recharge pattern were presented. The objective of the present study was to direct attention toward the evaluation of the theoretical model by comparing it with the corresponding linear and nonlinear models based on Dupuit-Forchheimer approximations for the unsteady hydrodynamic behavior of the proposed recharge system under saturated flow conditions. Superiority in regard to generality of its application as well as accuracy of the results obtained was demonstrated by comparing it with the pertinent experimental data and presented in the form of dimensionless graphs. (Prickett-ISWS)
W76-00555

SALT WATER INTRUSION INTO POROUS MEDIA,
S. V. Regional Coll. of Engineering and Technology, Surat (India).
For primary bibliographic entry see Field 2L.
W76-00614

AQUIFER PARAMETER IDENTIFICATION,
California Univ., Los Angeles. Dept. of Engineering Systems.
W. W-G. Yeh.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY9, Paper 11582, p 1197-1209, September 1975. 6 fig, 2 tab, 27 ref, 2 append.

Descriptors: *Groundwater, *Aquifer characteristics, *Numerical analysis, *Unsteady flow, Aquifers, Optimization, Mathematical studies, Hydraulics, Equations, Subsurface water, Transmissivity, Mathematics, Linear programming, Analytical techniques, Diffusion, Diffusivity.
Identifiers: Inverse problem, Parameter identification.

An analysis of the inverse problem of parameter identification in unsteady groundwater flow was presented. The response of the system is governed by a typical nonlinear second- order partial differential equation for which there exists no closed form solution. Identification is an inverse process whereby the parameters embedded in a differential equation are determined from observations of the system's input and output along with appropriate initial and boundary conditions. These parameters are usually not physically measurable. A simple but illustrative inverse problem was analyzed by quasilinearization, maximum principle, gradient method, the influence coefficient method, and linear programming. A comparison was made between these methods. The problem of convergence and stability was examined and demonstrated by numerical experimentation. (Prickett-ISWS)
W76-00650

GROUND-WATER LEVELS IN THE UNITED STATES, 1969-73: SOUTH-EASTERN STATES.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-00652

GROUND-WATER BASIC DATA FOR GRANT AND SIOUX COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. DAK.
For primary bibliographic entry see Field 7C.
W76-00653

IFICIAL RECHARGE IN THE UPPER TA ANA RIVER AREA, SAN BERNARDINO NTY, CALIFORNIA,
ogical Survey, Menlo Park, Calif.
rimary bibliographic entry see Field 4B.
00655

UND-WATER QUALITY IN INDIAN LS VALLEY, CALIFORNIA,
ogical Survey, Menlo Park, Calif.
rimary bibliographic entry see Field 5A.
00658

GROUND-WATER SITUATION IN THE CLEVILLE AREA, PICKAWAY COUNTY, TH-CENTRAL OHIO,
ogical Survey, Columbus, Ohio.
rimary bibliographic entry see Field 4B.
00661

MARY APPRAISALS OF THE NATION'S UND-WATER RESOURCES-UPPER ORADO REGION,
ogical Survey, Reston, Va.
ice, and T. Arnow.
lable from Supt. of Documents, GPO, Wash, 20402, Price $3.15 (paper copy). Professional r 813-C, 1974. 40 p, 24 fig, 2 plate, 5 tab, 97

riptors: *Water resources, *Surface waters, undwater resources, *Water supply, orado River basin, Arizona, Colorado, New co, Utah, Wyoming, Hydrologic data, Water , Streamflow, Aquifer characteristics, Water ation, Water resource development, Projec- , Available water.
ifiers: Upper Colorado Region.

Upper Colorado Region covers about 113,500 in parts of Arizona, Colorado, New Mexico, , and Wyoming. Drainage from about 97 per- of the region is to the Colorado River. The ominantly arid to semiarid region averages three persons per square mile and is used ly for grazing, recreation, and mineral opment. The water supply comes from pitation which averages about 95 million acre- per year. Development of the region's water y has been limited almost entirely to surface r. Only about 2 percent of the total estimated ne of water withdrawn (about 5.7 million ft) in 1970 came directly from groundwater es. Recoverable groundwater in just the r 100 feet of saturated rocks is estimated to be illion acre-feet. That amount is nearly four the total active storage capacity of all sur- water reservoirs in the region. By the year consumptive use of water within the region ater exports to adjacent regions are expected al more than 6.5 million acre-feet per year. dard-USGS)
00662

UNDWATER SEMINAR, GRANADA.
and Agriculture Organization of the United ns, Rome (Italy).
rimary bibliographic entry see Field 4B.
00807

UNDWATER RESERVOIRS: PHYSICAL S FOR THEIR USE,
u de Recherches Geologiques et Minieres, (France). Office of Geological and Mineral rch.
rimary bibliographic entry see Field 4B.
00809

HARGING OF UNDERGROUND WATER OSITS,
rimary bibliographic entry see Field 4B.
00810

GROUNDWATER RESOURCES: EVALUATION AND EXPLOITATION,
Arizona Univ., Tucson. Dept. of Geoscience.
For primary bibliographic entry see Field 4B.
W76-00812

MODELS FOR GROUNDWATER ANALYSIS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 4B.
W76-00816

WISCONSIN'S GROUNDWATER: AN INVALUABLE RESOURCE,
Wisconsin Univ., Madison. Cooperative Extension Programs.
D. Stephenson, and J. W. Clark.
Report G2651, October 1974. 19 p, 12 fig, 3 maps, 9 ref.

Descriptors: *Groundwater, *Groundwater resouces, *Wisconsin, Water supply, Water resources, Hydrologic cycle, Water properties, Zone of aeration, Zone of saturation, Recharge, Groundwater recharge, Discharge(Water), Aquifers, Wells, Water wells, Water quality, Regulation, Conservation, Pollutants.

Less than 1% of the earth's water is readily drinkable. Part of this 1% occurs in rivers, lakes, and ponds, but most of the good clean water is stored in the ground. Groundwater is a precious but limited resource; its quality can be destroyed easily. As the fast-growing population makes more demands on groundwater supply, a greater effort must be made to understand and protect it. This publication, designed to be understood by the general reader, is expected to aid public officials, study groups, teachers, and citizens of Wisconsin and other states. The properties of water, the world's total water system, and the hydrologic cycle were described. Further explanation was given of groundwater flow systems. Man's use of groundwater supplies was explored, and the problems of maintaining groundwater supplies and quality in the future were described. Maps depicted the thickness of glacial deposits in Wisconsin and probable well yields from bedrock and glacial deposits in the state. (Robinson-ISWS)
W76-00881

NUMERICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Colorado State Univ., Fort Collins.
C. E. K. Rovey.
Hydrology Paper No. 74, August 1975. 73 p, 36 fig, 2 tab, 23 ref, 2 append. AID/csd-2460.

Descriptors: *Groundwater, *Surface water-groundwater relationships, *Simulation analysis, *Model studies, *Numerical analysis, *Colorado, Aquifers, Mathematical models, Computer models, Aquifer management, Base flow, Groundwater availability, Water resources development, Analytical techniques, Digital computers, Alluvial aquifers.
Identifiers: *Arkansas Valley, *Finite-difference techniques, Confined-unconfined aquifers.

A three-dimensional, finite difference model was developed for simulating steady and unsteady, saturated and unsaturated flow in a stream-aquifer system. The basis of the model was a finite difference form of Richard's equation for unsaturated and saturated subsurface flow. Effects of streamflow on groundwater movement were treated by applying the appropriate boundary conditions to Richard's equation. Contributions of groundwater to river flow were quantified by including seepage rates in the computation of river discharge. The three-dimensional model was developed for use in this study to interact with two-dimensional model segments, which were interfaced with the three-dimensional model on its upstream and downstream ends. The model produced results which matched observed data for the study area, which consisted of a 40-mile reach of the Arkansas Valley of southeastern Colorado. Computed estimates of river discharge at each end of the study area and water table elevations throughout the region agreed reasonably well with observed data. An analysis of the sensitivity of results produced by the model to variation in the values of several input parameters was included as part of the study. (Prickett-ISWS)
W76-00882

GROUND-WATER LEVELS, 1968-1972,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 7C.
W76-00887

SUMMARY OF GROUND WATER QUALITY IN THE LOS ANGELES DRAINAGE PROVINCE,
California Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 7C.
W76-00888

ENVIRONMENTAL ISOTOPIC STUDY OF THE BARREMIAN-JURASSIC AQUIFER IN SOUTH DOBROGEA (ROUMANIA),
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
A. Tenu, P. Noto, G. Cortecci, and S. Nuti.
Journal of Hydrology, Vol. 26, No. 3/4, p 185-198, August 1975. 6 fig, 1 tab, 26 ref, 1 append.

Descriptors: *Isotope studies, *Groundwater movement, *Limestones, Aquifers, Carbonates, Oxygen isotopes, Carbon radioisotopes, Radioactive dating, Surface waters, Distribution patterns, Recharge, Deuterium, Velocity, Paleoclimatology, Mixing, Correlation analysis.
Identifiers: *Roumania, Danube River, Black Sea, Siutghiol Lake, SMOW(Standard Mean Ocean Water), PDB(Pee-Dee-Belemnite) standard.

The Barremian-Jurassic limestones represent the main groundwater aquifer supplying the South Dobrogea region. The waters from this aquifer have delta 018 and delta D values ranging from -12.8 to -11.0% and from -78.8 to -64.6% respectively, relative to SMOW. The delta C13 range is narrow, from -9.2 to -6.7% relative to PDB, while the C14 contents give corrected ages from 201 to 24,353 years. These data and their areal distributions in comparison with that of surface waters (Danube River, Siutghiol Lake, and Black Sea) have shown that: (1) the recharge area is on the west side of the region (in Ostrov district and to the south of it), and (2) the flow direction in the aquifer is WSW-ENE towards Siutghiol Lake. The water flow shows a unidirectional pattern on the west side with a constant velocity of 6.87 m/yr. There is a radial-divergent flow pattern on the east side, where the velocity of the main flow towards the lake is on the average 4.67 m/yr, while along a secondary direction it is 2.87 m/yr. (Visocky-ISWS)
W76-00894

THE USE OF ENVIRONMENTAL TRITIUM TO ESTIMATE RECHARGE TO A SOUTH-AUSTRALIAN AQUIFER,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
G. B. Allison, and M. W. Hughes.
Journal of Hydrology, Vol. 26, No. 3/4, p 245-254, August 1975. 4 fig, 1 tab, 7 ref.

Descriptors: *Tritium, *Groundwater recharge, *Australia, Groundwater movement, Aquifers, Hydrogeology, Soil moisture, Sinks, Hydraulic gradient, Model studies, Mathematical models, Equations, Dispersion, Potentiometric level, Irrigation, Correlation analysis, Pumping, Evapotranspiration.

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Identifiers: *South Australia, Padthaway-Keppoch Irrigation District, Naracoorte Range, Streamlines, Conceptual model, Piston flow, Fully mixed flow.

The tritium concentration of groundwater samples has been used to estimate the amount of water moving laterally into an aquifer as well as the quantity of local recharge. A multicompartment model used to calculate the variation of tritium concentration within the aquifer predicts that the lateral input of water is 24,000,000 cu m/yr, while local recharge is 27 mm/yr. These results are compared with conventional hydrogeological estimates of 18,000,000 cu m/yr and 70 mm/yr, respectively. (Visocky-ISWS)
W76-00896

MATHEMATICAL SIMULATION OF GROUNDWATER ABSTRACTION FROM CONFINED AQUIFERS FOR RIVER REGULATION,
Department of the Environment, Reading (England). Central Water Planning Unit.
A. B. Birtles, and W. B. Wilkinson.
Water Resources Research, Vol. 11, No. 4, p 571-580. August 1975. 13 fig. 17 ref.

Descriptors: *Groundwater, *Surface-groundwater relationships, *Simulation analysis, *Model studies, *Base flow, Aquifers, Mathematical models, Computer models, Numerical analysis, Aquifer management, Springs, Subsurface runoff, Water resources development, Analytical techniques, Digital computers, Flow nets.
Identifiers: *Finite difference method, *Implicit method.

The development of an initially confined aquifer for river regulation was considered. Model investigations covered a range of groundwater abstraction regimes and a number of aquifer systems typical of those found in the United Kingdom. The various factors affecting net gains were discussed. The main conclusions were that high net gains would be sustained only if unconfined storage was developed around the abstraction site. In practice this requires a high density of abstraction wells. Also, higher net gains could be obtained from those aquifers having a large response time. (Prickett - ISWS)
W76-00904

WATER RIGHTS,
Davis, Graham and Stubbs, Denver, Colo.
For primary bibliographic entry see Field 6E.
W76-00974

2G. Water In Soils

IMPACT OF FREEZING AND THAWING SOIL CONDITIONS ON THE MOVEMENT OF NUTRIENTS FROM RURAL LANDS,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-00502

SOIL CRUSTS.
Arizona Agricultural Experiment Station, Tucson. Technical Bulletin 214, (1974), 58 p. 192 ref. Edited by J. W. Cary and D. D. Evans.

Descriptors: *Soil physical properties, *Soil surfaces, *Soil management, *Soil cements, Soil strength, Soil sealants
Identifiers: *Soil crusts, Cementing agents.

This publication is based on the research conducted by the scientists associated with the Wester Regional Research Project W-66 during the period 1964 to 1970. Significant progress was made toward understanding and improving the management of crusting soils; since the subject is relatively narrow, it was possible to cover most aspects of crusting in a single publication. The first chapter is written for a broad audience, including all those who are faced with practical problems involving soil crusts. Chapters 2 through 5 are more detailed, and provide the technical background required for in-depth understanding of soil crust behavior. In addition to the information presented in this bulletin that has not been previously published, a rather extensive review and discussion of appropriate literature has also been included. (See W76-00518 thru W76-00524)
W76-00517

MANAGEMENT OF CRUSTING SOILS: SOME PRACTICAL POSSIBILITIES,
Colorado State Univ., Fort Collins. Engineering Research Center.
W. D. Kemper, and D. E. Miller.
In: Soil Crusts, Arizona University Agricultural Experiment Station, Technical Bulletin 214, 1974. p 1-6, 3 fig. J. W. Cary and D. D. Evans, eds.

Descriptors: *Soil physical properties, *Soil surfaces, *Hydraulic conductivity, *Organic matter, *Vegetation effects, Runoff, Erosion, Soil management, Plant growth, Soil water movement, Bulk density, Cover crops, Irrigation, Mulching, Cultivation, Surface sealing.
Identifiers: *Soil crusts.

Soils with low organic matter and high silt content usually have low aggregate stabilities which are commonly associated with soil crusting. High levels of sodium make these problems even more severe. Soils with higher organic matter contents (2 or 3 percent or more) are less susceptible to crusting which is attributed to long organic molecules acting as glues holding particles together in fairly stable aggregates. Organic matter may also reduce swelling pressure forces and wetting rates, and modify surface tension forces. A permanent cover crop, such as grass, increases soil organic matter, but much is lost under row crop conditions because of exposure of new surfaces and accelerated microorganism decomposition. (See also W76-00517) (Robinett-Arizona)
W76-00518

MODIFICATION OF SOIL CRUSTS FOR PLANT GROWTH,
Agricultural Research Service, Prosser, Wash. Irrigated Agriculture Research and Extension Center.
D. E. Miller, and R. O. Gifford.
In: Soil Crusts, Arizona University Agricultural Experiment Station, Technical Bulletin 214, p 7-16, 1974, 4 fig, 3 tab. J. W. Cary and D. D. Evans, eds.

Descriptors: *Soil physical properties, *Plant growth, *Mulching, *Soil compaction, *Vegetation establishment, Soil surfaces, Hydraulic conductivity, Runoff, Erosion, Soil management, Soil water movement, Irrigation, Cultivation, Soil properties, Surface sealing, Soil moisture.
Identifiers: *Seedlings, *Soil crusts.

Probably the most important effect of soil crusts is on emergence and early development of seedlings. Also, seedlings may be injured by soil movement during cultivation of a crusted soil. Reducing water drop impact by surface mulches or reducing the water drop momentum by reducing droplet size and application rates are methods of preventing crusts. A group of seedlings has a better chance of crust penetration than does a single seedling and keeping the soil moist during seedling emergence will decrease crust strength. (See also W76-00517) (Robinett-Arizona)
W76-00519

BONDING MECHANISMS FOR SOIL CRUST PART I. PARTICLE SURFACES AND CEMENTING AGENTS,
Hawaii Univ., Honolulu Dept. of Agronomy a Soil Science
G. Uehara, and R. C. Jones
In: Soil Crusts, Arizona University Agricultu Experiment Station, Technical Bulletin 214, 197 17-28, 8 fig, 1 tab. J. W. Cary and D. D. Evans, e

Descriptors: *Soil physical properties, *Soil s faces, *Surface sealing, *Soil cement *S chemistry, Particle size, Cation exchange, Io Cation absorption, Crystallization, Cla Minerology, Silicates, Organic matter, Gypsu Lime.
Identifiers: *Soil crusts, Cementing agents.

Factors which are know to affect soil structu stability include mineralogy of layered silicat texture, composition of sorbed cations, and co centration of various organic substances, sili and sequioxides. Charge characteristics, crys imperfections, surface coatings, the role of wa and texture in crust development, silica, organ matter, and gypsum and lime in relation to s crust formation are discussed. (See also W7 00517) (Robinett-Arizona)
W76-00520

BONDING MECHANISMS FOR SOIL CRUST PART II. STRENGTH OF SILICA CEMENTATION,
Nevada Univ., Reno, Plant, Soil and Wat Science Div.
R. O. Gifford, and D. F. Thran.
In: Soil Scrust, Arizona University Agricultu Experiment Station, Technical Bulletin 214, p 2 30, 1974, 1 fig, 1 tab. J. W. Cary and D. D. Evans,

Descriptors: *Silica, *Soil physical properties *Soil surfaces, *Soil cement, *Silicates, Surfa sealing, Soil chemistry, Crystallization, Minerol gy, Clays, Tensil strength, Strength of material Soil strength, Soil chemical properties, Partic shape.
Identifiers: *Soil crusts, Cementing agents.

Glass beads were washed to remove surface alka When a drop of distilled water was placed arou a group of these beads, the spheres were roll together by surface tension as the drop of wat evaporated. Water evaporated last from the poin of contact between the spheres where any di solved material was concentrated resulting in c mentation of the beads. Strength of cementi material measured was significant but it probab can explain only a part of the strength of natur soil crusts. (See also W76-00517) (Robinet Arizona)
W76-00521

CRUST STRENGTH AND CRACKING: PART STRENGTH,
Colorado State Univ., Fort Collins. Engineerin Research Center.
W. D. Kemper, D. D. Evans, and H. W. Hough.
In: Soil Crusts, Arizona University Agricultur Experiment Station, Technical Bulletin 214, p 3 38, 1974, 6 fig. J. W. Cary and D. D. Evans, eds.

Descriptors: *Soil Physical Properties, *Soil su faces, *Particle shape, *Soil strength, *Soil chem cal properties, Soil cement, Soil chemistry, Part cle size, Minerology, Crystallization, Strength c materials, Bonding, Molecular structure, Cultiva tion, Wetting.
Identifiers: *Soil crusts, Crust strength.

In general the strength of soil crusts depends o the strength of particle-to-particle bonds, and ma be written as: Crust strength equals (Bon strength, number of bonds, particle shape). The ef fect of soil components and wetting and cultiva tion history on crust strength, is primarily throug their effects on these 3 parameters. (See also W76 00517) (Robinett-Arizona)

-00522

JST STRENGTH AND CRACKING: PART II. ACKING,
cultural Research Service, Pendleton, Oreg. mbia Plateau Conservation Research Center.
. Rickman.
Soil Crusts, Arizona University Agricultural eriment Station, Technical Bulletin 214 p 39-974, 4 fig, 1 tab. J. W. Cary and D. D. Evans,

criptors: *Soil physical properties, *Soil sur-s, *Soil strength, *Cracks, sticity(Mechanical), Soil cement, Soil chemis-Strength of materials, Soil compaction, Soil erties, Elastic theory, Soil moisture, Moisture ent, Soil density.
tifiers: *Soil crusts, Cracking, Griffith's king theory.

application of Griffith's cracking theory to requires that material properties used in the ry (Elastic modulus and critical energy release be measured as a function of water content soil density. The modulus of rupture technique ars to be sufficient to obtain energy release . Several techniques are available to obtain ic modulus for soils, including static methods ighly compacted soils in the laboratory or in field for uncompacted soils. (See also W76-7) (Robinett-Arizona)
-00523

INFLUENCE OF SOIL CRUSTS ON HEAT WATER STORAGE,
cultural Research Service, Kimberly, Idaho. e River Conservation Research Center.
Cary, and D. D. Evans.
Soil Crusts, Arizona University Agricultural eriment Station, Technical Bulletin 214, p 45-974, 5 fig. J. W. Cary and D. D. Evans, eds.

criptors: *Soil physical properties, *Soil sur-s, *Soil moisture, *Soil temperature, *Heat sfer, Soil cement, Soil properties, Moisture ent, Thermal properties, Soil-water-plant rela-hips, Water storage, Infiltration, Infiltration , Erosion, Flooding, Water vapor, Soil densi-oil texture, Vegetation establishment.
tifiers: *Soil crusts.

il crust can reduce water intake by one or two rs of magnitude, which may result in flooding erosion. Effects of crusts on water vapor and exchange between the soil and atmosphere nore subtle, but nonetheless real. The extent depth of cracking, soil density, surface tex- and color are important. Severe soil crusts have the greatest effects on water and energy ange by preventing the establishment of s. (See also W76-00517) (Robinett-Arizona)
-00524

EFFECT OF SOIL CRUSTS ON INFILTRA-N: THE EFFECT OF AGGREGATE SIZE DEPTH OF TILLAGE ON STEADY INFIL-TION THROUGH CRUST-TOPPED TILLED .S,
esota Univ. St. Paul.
Farrell.
ed Fac Landbouwwet Rijksuniv Gent., Vol o 3, p 1132-1149. 1972

riptors: *Infiltration, Capillary conductivity, ggregates, Soils, Cultivation.
ifiers: *Soil crusts.

oretical study of a crusted tilled soil was re-d. The capillary conductivity of an ag-ted tilled layer was calculated from geometri-onsiderations. From this information the ef-f aggregate size, depth of aggregate bed, and ulic resistance of surface crust upon final in-tion rate can be calculated.--Copyright 1974, gical Abstracts, Inc.

W76-00539

EMPIRICAL METHODS OF USING SOILS AS RADIATION DOSIMETERS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5A.
W76-00542

VOID CHANGES IN ALLOPHANE SOILS DETERMINING WATER RETENTION AND TRANSMISSION,
Macdonald Coll., Montreal (Quebec). Dept. of Soil Science.
T. Maeda, and B. P. Warkentin.
Soil Science Society of America Proceedings, Vol 39, No 2, p 398-403, May-June 1975. 13 fig, 2 tab, 17 ref.

Descriptors: *Soil water movement, *Retention, *Voids, *Diffusivity, *Drying, Compacted soils, Saturation, Hydraulic conductivity, Infiltration, Porosity, Bulk density, Wet climates, Clays, Porous media, Shrinkage, Laboratory tests.
Identifiers: *Allophane soils, *West Indies, *Japan, Amorphous clays, Soil columns.

Water retention and transmission were measured on eight samples of allophane soils from the West Indies and Japan. Standard methods of pressure plate, horizontal infiltration, and steady-state horizontal flux were used. Soils with high allophane content had a sigmoid water content vs. log suction curve. Drying did not change the shape of the curve, but decreased the water content at any suction. Soils with low allophane content showed a more linear water content vs. log suction curve, resembling that of clay soils with crystalline minerals. Water tranmission in undried allophane soils was slow because of the high proportion of microvoids. Air-dried or oven-dried samples had a higher proportion of macrovoids, and more rapid infiltration of water. This change in void size distribution was large enough to dominate the effect of greater volume of voids to be filled with water in an initially dry soil, with the result that water movement in allophanes increased as initial water content decreased. (Schicht-ISWS)
W76-00559

HYDROSALINE REGIME OF SOME SOILS IN THE MIDDLE PART OF THE CALMATUI RIVER BASIN. (IN RUMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
G. Obrejanu, G. Sandu, N. Rudzic, S. Nastea, and G. Cosma.
An Inst Stud Cercet Pedol. 39 p, 445-459. 1971 Illus. English summary.

Descriptors: Soils, Soil types, *Saline soils, *River basins, Europe, Soil groups, *Chernozems, *Soil investigations, *Salinity, Percolation, Leaching, Irrigation effects.
Identifiers: Calmatui River, Hydro selinity, Solonchak, Solonetz.

The hydrosaline regime of 3 representative genetic soil types located in the middle part of the Calmatui river basin was studied between 1963-1969. The soils were: low-terrace chernozem salinized and solonized in depth of the profile; cropped solonetz and solonetz-solonchak. Soil water regime was represented by chronoisopleths given on available water categories, while the salt regime was represented by chronizopleths of mineral residue. Evolution of water and salt regimes in the soil profile is presented, and their strong relationship is stressed. The positive influence of tillage works on both soil hydrosaline regime and soil-forming process direction is emphasized. The terrace chernozem salinized and solonized in depth of profile possess an alternating, percolative, desuctive hydrosaline regime with salts accumulation at depth. Under the influence of tillage, columnar solonetz exhibits a hydrosaline regime characteristic to periodically irrigated, cropped soils with an intense desalinizating percolation. The solonetz-solonchak is characterized by an un-percolative-exudative hydrosaline regime in the upper part, while weakly desuctive, at depth. Under the influence of both drainage canals and vegetation the hydrosaline regime became percolative-exudative with alternating periods of leaching and upward movement of soluble salts. Copyright 1974, Biological Abstracts, Inc.
W76-00573

STEADY INFILTRATION FORM BURIED, SURFACE, AND PERCHED POINT AND LINE SOURCES IN HETEROGENEOUS SOILS: II. FLOW DETAILS AND DISCUSSION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
J. R. Philip, and R. I. Forrester.
Soil Science Society of America Proceedings, Vol 39, No 3, p 408-414, May-June 1975. 10 fig, 7 ref.

Descriptors: *Soil water movement, *Infiltration, *Steady flow, *Unsaturated flow, *Equations, Gravitational water, Percolation, Seepage, Soil moisture, Potential flow, Soil properties, Soil water, Irrigation, Subsurface irrigation, Infiltration rates, Soils, Groundwater, Furrow irrigation.
Identifiers: *Point and line sources, *Trickle irrigation, *Moisture potential.

Previous word developed physically relevant source solutions of the quasilinearized steady infiltration equation, generalized to apply to heterogeneous soils with conductivity depending exponentially on both moisture potential and depth. The results were discussed here in further detail, and graphs of a wide range of solutions were included. The graphical solutions presented spacially distributed Stokes stream and moisture potential functions for various depth-dependent conductivities. (See also W72-08207) (Prickett-ISWS)
W76-00649

EFFECT OF DAILY IRRIGATION ON WATER CONTENT AND SUCTION PROFILES IN SOILS OF THREE TEXTURES,
Agricultural Research Service, Prosser, Wash. Western Region.
D. E. Miller.
Soil Science Society of America Proceedings, Vol 39, No 3, p 512-515. May-June 1975 5 fig, 5 ref.

Descriptors: *Irrigation effects, *Soil texture, *Soil water movement, *Soil types, *Moisture tension, Drainage effects, Evapotranspiration, Irrigation, Irrigation efficiency, Plant growth, Soil physical properties, Soil properties, Soil-water-plant relationships, Moisture content, Soil moisture, Soil profiles, Infiltration, Soil types, Hydraulic conductivity.

Soil irrigated to replace just evapotranspiration losses produced profiles that depended upon the flow characteristics of the soil. In Shano silt loam in which the water moved readily, water distribution was nearly uniform with depth and did not change time. In soils in which water moved slowly, either because of slow internal water movement when wet (Ritzville loam) or low unsaturated conductivities at relatively low suctions (Sagehill sand), the upper soil became wetter while the lower soil water decreased by a corresponding amount. With the soil profile initially wet, several weeks of deficit irrigation passed before surface soil water content changed markedly. (Robinett-Arizona)
W76-00697

SOIL WETTABILITY AND FIRE IN ARIZONA CHAPARRAL,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

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D. G. Scholl.
Soil Science Society of America Proceeding, Vol 39, No 2, p 356-361. March-April, 1975 4 fig, 1 tab, 18 ref.

Descriptors: *Infiltration, *Penetration, *Wettability, *Burning, *Soil surfaces, Hydraulic conductivity, Permeability, Pervious soils, Soil management, Soil physical properties, Soil properties, Soil structure, Soil types, Soil chemical properties, Wetting, Interfaces, *Arizona, Chaparral, Arid lands, Range management, Forest fires, Forest management, Volitility, Thermal properties, Organic matter.
Identifiers: Wetting angle, Water repellent soils.

Soils on typical Arizona chaparral sites showed water repellence both before and after fire. Field and laboratory fires caused major changes in the water repellency of 4 natural soil layers, with relatively cool fires causing repellency at the surface and hot fires producing repellence at a greater depth but rendering the surface layer completely wetable. Measurement of the wetting angle of soil layers from progressively hotter fires made it possible to determine temperatures where water-repellent layers are first formed and then destroyed. Volatilization and subsequent loss to the atmoshpere is believed to be an important part of the loss of organic matter which decreased at the progressively higher temperatures. At temperatures above 270 C, the material causing water repellence is almost completely lost while below 270 C sufficient material is trapped and condensed on exchange sites to produce water repellence. (Robinett-Arizona)
W76-00698

IRRIGATION METHOD AS A DETERMINANT OF LARGE PORE PERSISTENCE AND CRUST STRENGTH OF CULTIVATED SOILS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
W. D. Kemper, J. S. Olsen, and A. Hodgdon.
Soil Science Society of America Proceedings, Vol 39, No 3, p 519-523, May-June 1975. 6 fig, 1 tab, 6 ref.

Descriptors: *Wetting, *Air entrainment, *Irrigation systems, *Soil surfaces, *Soil physical properties, Hydraulic conductivity, Infiltration, Permeability, Interstices, Soil properties, Soil structure, Soil types, Wettability, Aeration, Saturated soils, Soil gases, Irrigation, Pores, Capillary conductivity, Pore pressure, Flooding, Soil aggregates, Saturation, Capillary action.
Identifiers: Crust strength, Modulus of rupture, Seedling emergence.

Air dried soils were wetted by flooding, immersion, slow immersion and capillary action resulting in successively slower rates of wetting. Slow capillary wetting of a weekly structured soil allowed retention of more large size pore space than did rapid wetting of a well structured soil. Breaking strength of dried soils which had been wet by rapid immersion, capillary action, and capillary action followed by immersion, was much greater for soils wet by rapid immersion. Immersion following slow capillary wetting resulted in soils with intermediate breaking strengths. A study on corn (Zea mays L.) seedling emergence from a weakly structured soil showed less than 50% emergence for flooding and up to 100% for capillary wetting. (Robinett-Arizona)
W76-00699

ESTIMATING EVAPORATION: A TECHNIQUE ADAPTABLE TO REMOTE SENSING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2D.
W76-00701

REHABILITATION OF LAND DISTURBED BY SURFACE MINING COAL IN ARIZONA,
Arizona Univ. Tucson Dept of Watershed Management.
For primary bibliographic entry see Field 5G.
W76-00709

RESPONSE TO THREE SEMIDWARF MEXICAN WHEATS TO DIFFERENT AERATION CONDITIONS IN THE ROOTING MEDIUM AT A CONSTANT SALINITY LEVEL,
Escuela Nacional de Agricultura Chapingo (Mexico).
For primary bibliographic entry see Field 3C.
W76-00710

FIELD STUDY OF SOLUTE MOVEMENT IN A HIGHLY AGGREGATED OXISOL WITH INTERMITTENT FLOODING: II. PICLORAM,
Hawaii Univ., Honolulu, Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 5B.
W76-00718

COLUMN STUDIES OF SOIL CLOGGING IN A SLOWLY PERMEABLE SOIL AS A FUNCTION OF EFFLUENT QUALITY,
Wisconsin Univ., Madison Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W76-00721

NITRATE AND CHLORIDE LEACHING IN A SWELLING CLAY SOIL,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
For primary bibliographic entry see Field 5B.
W76-00724

NITRATE CONCENTRATIONS IN DEEP SOIL CORES AS RELATED TO SOIL PROFILE CHARACTERISTICS,
Californai Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-00726

A SIMULATION MODEL FOR PREDICTION OF HERBICIDE PERSISTENCE,
National Vegetable Research Station, Wellesbourne (England).
For primary bibliographic entry see Field 5B.
W76-00730

THE CONTROL OF NITRATE ACCUMULATION IN SOILS BY INDUCED DENITRIFICATION,
Technion-Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 5B.
W76-00732

SMALL TENSIOMETERS FOR FIELD AND LABORATORY STUDIES,
Agricultural Research Service, Gainesville, Fla.
J. S. Rogers.
Soil Science Society of America Proceedings, Vol 38, No 4, p 690-691, July-August, 1974, 1 fig.

Descriptors: *Tensiometers, Laboratory equipment, Soil moisture, Soil water, Soil investigations.

A small tensiometer was constructed and used in field and laboratory studies. The units are suitable only for low suctions, but have the fast response time that is desirable for measuring short-term changes in field and laboratory studies of drainage. Several tensiometers have been in use for over 4 years and continue to perform very satisfactorily. (Skogerboe-Colorado State)
W76-00733

EFFECT OF SALTS AND SALTS PLUS NITROGEN-15-LABELED AMMONIUM CHLORIDE ON MINERALIZATION OF SOIL NITROGEN, NITRIFICATION, AND IMMOBILIZATION,
Arizona Univ., Tucson Dept. of Soils, Water and Engineering
For primary bibliographic entry see Field 3C.
W76-00735

MORE ON AN APPROXIMATE SOLUTION FOR NONLINEAR DIFFUSION,
Cornell Univ., Ithaca, N.Y. Coll. of Engineering.
W. Brutsaert
Water Resources Research, Vol 10, No 6, p 1251-1252, December 1974. 11 ref.

Descriptors: *Diffusion, Mathematical studies, Soil water, Soil water movement, *Diffusivity.

A method of solution developed earlier (1970) (See also W70-07010) for a diffusivity, that is, a power function of concentration, is shown to be more generally applicable. On of the conditions of its applicability is the existence of a sharp diffusing front. As an illustration the solution is worked out herein for a diffusivity that has been useful in the analysis of soil water problems. (Skogerboe-Colorado State)
W76-00740

COMPUTER MODELING OF NITROGEN TRANSFORMATIONS IN SOILS,
California Univ., Davis. Dept. of Water Science and Engineering.
M. Mehran, and K. K. Tanji.
Journal of Environmental Quality, Vol 3, No 4, p 391-395, October-December, 1974. 7 fig, 1 tab, 20 ref.

Descriptors: *Nitrification, *Denitrification, *Model studies, *Nitrogen, Computer models, Soil profiles, Soil investigations, Water pollution sources.

A nitrogen-transformation model was formulated for simultaneous computation of various N transformations: nitrification, denitrification, mineralization, immobilization, ion exchange, and plant uptake. These processes were assumed to obey first-order kinetics. Differential equations that describe the above processes are solved simultaneously by using the 4th-order Runge-Kutta method and the Adams-Bashforth-Moulton predictor-corrector equations. The computer model was tested against data reported from several incubation studies. This model could be linked to a transport model to predict the temporal and spatial distribution of various N species in soil profiles. (Skogerboe-Colorado State)
W76-00831

NITRATE OCCURRENCE IN SOME SOILS WITH AND WITHOUT NATRIC HORIZONS,
Illinois Univ., Urbana. Dept. of Agronomy.
E. P. Gentzsch, E. C. A. Runge, and T. R. Peck.
Journal of Environmental Quality, Vol 3, No 1, p 89-94, January-March, 1974. 1 fig, 5 tab, 14 ref.

Descriptors: *Nitrates, *Nitrogen, *Soil properties, *Soil horizons, Soil investigations, Fertilization, Fertilizers, Groundwater, Water quality, *Illinois.
Identifiers: Natric horizons.

The effect of animal activity and fertilizer practices on the nitrate content in soils with and without natric horizons was investigated in a field study in southern Illinois where excessive groundwater nitrate levels were reported. Most of these soils are poorly drained. A comparison is provided by the poorly and well-drained soils without natric horizons observed in central Illinois. The results indicate that soils with natric horizons at shallow depths or dark-colored poorly drained soils had

evels of nitrate in the profile; all other soils ing increased nitrate levels in the entire le or below the root zone were related to the nt of fertilizer used or the amount of animal ity. Animal operations resulted in larger nts of nitrate in similar soil profiles than did izer applications. Increased nitrate content of round water, sampled in Washington County, rly was related to fertilizer practices and l activity in all soils, except under soils with horizons at shallow depths. (Skogerboe-ado State)
00836

D TEST OF SOIL WATER FLUX METERS,
ultural Research Service, Riverside, Calif. ty Lab.
rksen.
actions of the ASAE, (American Society of ultural Engineers), Vol 17, No 6, p 1038- November-December, 1974. 4 fig, 1 tab, 5

iptors: *Soil water, *Soil water movement, roperties, Soil tests, Tensiometers, Instru- ation, Measurement.
fiers: *Soil water flux meters.

tempt was made to measure soil water fluxes ly in essentially undisturbed soil. This was plished by excavating access holes perpen- rly to the direction of flow with a specially ed apparatus. Filter plates were pressed t undisturbed soil by a spring. Fluxes were ured by adjusting the overall hydraulic head cross the meters, with a variable hydraulic ance, to that in the soil nearby. Two flux me- ave realistic results that were generally in agreement with each other. They reacted y to different hydraulic resistance values tent with earlier laboratory tests. This is in contrast with an earlier attempt in which the holes were dug by hand resulting in a ete failure. (Skogerboe-Colorado State)
00838

DERED METAL PLATES FOR CON- CTING UNSATURATED FLOW CELLS,
ultureal Research Service, Fresno, Calif. Management Research.
Bianchi.
Science Society of American Proceedings, , No 4, p 683-684, July-August, 1974. 3 fig, 1 ref.

iptors: *Unsaturated flow, Flow measure- *Recharge, Groundwater movement, ure.
fiers: *Moisture flux.

bed is the theoretical design, construction served characteristics of sintered stainless owdered metal plates which could be used trol sections of an unsaturated flow cell. rboe-Colorado State)
0840

R FLOW THROUGH MIXED CLAYS,
Inst. of Tech. and Science, Pilani (India). f Chemistry.
rivastava, A. K. Jain, and S. K. Upadhyay. l of Hydrology, Vol. 26, No. 3/4, p 295-301, t 1975. 6 fig, 1 tab, 7 ref.

ptors: *Flow, *Clays, Kaolinite, Bentonite, law, Laboratory tests, Suspension, Equip- Hydraulic conductivity, Compaction, Pres- ensity, Viscosity, Equations.
iers: *Mass fractions, *Non-Newtonian

flow measurements through mixtures of compositions of kaolinite and bentonite were made. The data revealed an interrela- p among the hydraulic conductivity of the clay mixture, hydraulic conductivities of the constituent clays, and the composition of the mixtures. The mixtures up to the mass fraction 0.2 obeyed Darcy's law, while those of mass fraction 0.3 or greater did not. (Visocky-ISWS)
W76-00898

A DEPENDENT DOMAIN MODEL OF CAPILLARY HYSTERESIS,
Technion-Israel Inst. of Tech. Haifa. Faculty of Civil Engineering.
Y. Mualem, and G. Dagan.
Water Resources Research, Vol. 11, No. 3, p 452-460, June 1975. 15 fig, 7 ref, 2 append.

Descriptors: *Hysteresis, *Capillary water, *Capillary fringe, *Mathematical models, Model studies, Wetting, Drying, Soil moisture, Soil water, Hygroscopic water, Pores.
Identifiers: *Hysteretic loop, *Dependent domain model, Drying curves, Wetting scanning curves, Drying scanning curves, Wetting curves, Pore blockage.

A model of capillary hysteresis which takes into account the phenomenon of blockage against air (and water) entry was presented. The model was based on our previous (1974) model II, which predicts any hysteretic path with the aid of two functions, L(Psi) and H(Psi). The model was generalized by adding a new function of pore blockage against air (and a function of pore blockage against water), as has been suggested by D. H. Everett (1967) and G. C. Topp (1971). It was found that the function of pore blockage against water is of a lesser significance and can be neglected in most cases. A technique of deriving L(Psi), H(Psi), and the function of pore blockage against water from the measured boundary loop and one primary drying scanning curve was presented. A simple method of predicting any hysteretic path was suggested. It was found that the generalized model leads to better results than the models based on independent domain theories for soils having a major portion of their hysteretic loop in the range of air entry value. (Sanderson - ISWS)
W76-00903

IN SITU SOIL GAMMA ANALYZER--A NEW APPROACH TO DETERMINE THE MOVEMENT OF POLLUTANTS IN SOILS.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W76-00912

2H. Lakes

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
Available from the National Technical Information Service Springfield, Va 22161 as COM-74-10032. International Field Year for the Great Lakes (IFYGL) Bulletin No 8, October 1973. 78 p, 16 fig, 4 tab, 6 append.

Descriptors: *Great Lakes, *International waters, *International, Hydrological Decade, *Canada, *United States, Lake Ontario, Remote sensing, Water temperature, Surveys, Meteorological data, Programs, Publications, Currents(Water), Circulation, Evaporation, Meteorology, Solar radiation, Cloud cover, Wind velocity.
Identifiers: *International Field Year of the Great Lakes.

Three Canadian projects were reported: (1) High Altitude Remote Sensing Surveys of Lake Ontario, (2) Momentum, Heat and Moisture Transfer in the Atmospheric Surface Layer Over Lake Ontario, and (3) T-33 Airplane Investigations of the Boundary Layer. Data were presented for surface temperature, turbidity, and climatological data. Brief reports of U. S. scientific projects were included. U. S. publications were listed. (Humphreys-ISWS)
W76-00535

EFFECT OF WIND STRESS ON STRATIFIED DEEP LAKE,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
N-E. O. Hansen.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY8, Paper 11484, p 1037-1052, August 1975. 7 fig, 19 ref, append.

Descriptors: *Lakes, *Entrainment, *Stratified flow, *Mixing, Winds, Stratification, Velocity, Currents(Water), Dispersion, Diffusion, Density, Turbulence, Analysis, Hydraulics.
Identifiers: *Wind shear.

The basic equations for wind-driven flows in deep two-layered lakes were outlined. The deepening of the upper layer due to entrainment of more dense water from the lower layer were explained physically, and the entrainment was related to the wind shear stress at the water surface and an overall Richardson number. The general shapes of the distributions of shear stress and velocity were outlined. Diffusion and dispersion coefficients were calculated and related to the depth of the upper layer and to the wind shear stress at the surface. (Adams-ISWS)
W76-00551

THE THEORY OF WAVE PROPAGATION IN WATER OF GRADUALLY VARING DEPTH AND THE PREDICTION OF BREAKER TYPE AND HEIGHT,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2L.
W76-00557

FORMATION AND DEVELOPMENT OF LAND-AQUATIC VEGETATION IN SHALLOW WATERS OF THE DNIEPER, PRIPYAT AND TETEREV FLORA PLAINS (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
For primary bibliographic entry see Field 2I.
W76-00582

GREEN BAY SELF-PURIFIES ALGAL NUTRIENTS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W76-00615

MAN'S ACCELERATION OF HYDROGEOCHEMICAL CYCLING OF PHOSPHORUS: EUTROPHICATION OF INLAND AND COASTAL WATERS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W76-00620

HYDROLOGY OF THE LAKE WINGRA BASIN, DANE COUNTY, WISCONSIN.
Geological Survey, Madison, Wis.
E. L. Oakes, G. E. Hendrickson, and E. E. Zuehls.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 626, $3.75 in printed copy, $2.25 i microfiche. Water-Resources Investigations, 17-75, July 1975. 31 p, 5 fig, 1 plate, 10 tab, 8 ref.

Descriptors: *Hydrologic budget, *Lakes, *Wisconsin, *Hydrology, *Hydrologic data, Inflow, Discharge(Water), Water storage, Runoff, Groundwater movement, Surface waters,

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Evaporation, Precipitation(Atmospheric), Evapotranspiration.
Identifiers: *Lake Wingra basin(Wis)

A water budget was prepared to identify the components of the hydrologic system in the Lake Wingra basin, Wisconsin. The Lake Wingra basin, which includes a small eutrophic lake within the city of Madison is partly a protected area and parly an urbanized area. Measured and estimated inflow and outflow to and from the lake in 1 year (June 1972 and May 1973) was about 4.5 metres (15 feet)--approximately twice the volume of the lake. Inflow to the lake is about 25 percent from direct precipitation on the lake surface, and the rest from nearly equal amounts of surface runoff and groundwater inflow. Outflow from the lake is about 10 percent groundwater outflow, 15 percent evaporation from the lake surface, and 75 percent discharge at the surface outlet. Increased withdrawal of water from municipal and industrial wells in Madison has slowed the rate of flow through the lake. The calculated 1972 water budget for the lake showed gains of about 3,560 millimetres (140 in.) and losses of about 3,500 millimetres (138 in.). A discrepancy of about 60 millimetres (2 in.) probably was caused in part by uncertainties in groundwater inflow and outflow and by evapotranspiration and groundwater inflow in the marsh area southwest of the lake. (Woodard-USGS)
W76-00667

THE EFFECT AND FATE OF CRUDE OIL SPILT ON TWO ARCTIC LAKES,
Fisheries Research Board of Canada, Winnipeg (Manitaba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W76-00863

IN SITU COLOUR MEASUREMENTS ON THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington(Ontario).
For primary bibliographic entry see Field 5A.
W76-00885

PROPERTY--CLASSIFYING BODIES OF WATER AS LAKES OR STREAMS,
For primary bibliographic entry see Field 2E.
W76-00931

ON THE CONCEPT OF LAKE STABILITY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso.
Limnol Oceanogr, Vol 18, No 4, p 681-683, 1973.

Descriptors: *Lakes, Stability.

A new equation describing the stability of a lake, as conceptually defined by Schmidt, is developed to supply information on the contribution of each lake layer to stability. It is analogous in form to the expression derived by Birge for his concept of direct work of the wind and may be combined with that to yield a curve for direct total work as a function of lake depth.--Copyright 1974, Biological Abstracts, Inc.
W76-00990

THE INFLUENCE OF FISH ON THE DISTRIBUTION OF CHAOBORUS SPP. (DIPTERA) AND DENSITY OF LARVAE IN THE MATAMEK RIVER SYSTEM, QUEBEC,
Waterloo Univ. (Ontario). Dept. of Biology.
G. F. Pope, J. C. H. Carter, and G. Power
Trans Am Fish Soc, Vol 102, No 4, p 707-714, 1973. Illus

Descriptors: *Lakes, *Fish food organisms, Diptera, Canada.
Identifiers: Chaoborus, Matamek River(Quebec), Scandanophasma.

The distribution and limnetic density of 5 spp. of Chaoborus larvae were determined in 26 lakes of the Matamek River System, Quebec, Canada. The distribution of C. Americanus is closely related to the absence of fish while C. punctipennis is associated with fish populations. The distributions of C. trivittatus and C. flavicans appear independent of the presence of fish, but C. flavicans reaches its greatest density in the 3 lakes with the largest basins. A probable new species or subspecies of the subgenus Scadanophasma was found in 3 lakes. The standing crop of limnetic Chaoborus larvae is higher in lakes without fish than with fish.--Copyright 1974, Biological Abstracts, Inc
W76-00993

DEEP WATER WAVES IN LAKES,
Nature Conservancy, Edinburgh (Scotland).
I. R. Smith, and I. J. Sinclair.
Freshwater Biol, Vol 2, No 4, p 387-399, 1972, Illus.

Descriptors: *Waves(Water), *Lakes.

The properties of waves on a lake surface and the influence of water depth on these properties are discussed. The method, derived by the Beach Erosion Board, of predicting wave characteristics if the wind speed and fetch are known is outlined and the validity of the method in Loch Leven, Scotland, is confirmed. This prediction technique is then combined with the equations of classical hydrodynamics to form a method of assessing the nature and extent of wave action in lakes without direct measurement. The value of the ratio of the wave-mixed volume to the total lake volume as a measure of hydraulic conditions in lakes is suggested.--Copyright 1973, Biological Abstracts, Inc.
W76-01000

2I. Water In Plants

THE ROACH (RUTILUS RUTILUS L.) FROM THE DAM RESERVOIR IN PRZECZYCE, POLAND,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
S. Skora.
Acta Hydrobiol, Vol 14, No 4, p 399-418, Illus, 1972.

Descriptors: *Algae, Reservoirs, *Fertility, Aquatic insects, *Fish food organisms, Fish, Larvae.
Identifiers: *Poland(Przeczyce), *Roach, Rutilus-rutilus.

The body length, body weight, growth, age, variability of 30 morphological features of the body, variability of meristic features and fertility of 205 specimens of the roach from the dam reservoir in Przeczyce (Poland) were examined. The contents of the alimentary canal of this fish were analyzed. The growth of the examined fish, in comparison with that of this species in other reservoirs, was considered fair. A decrease and equalization of relative variability of morphological features is similar to that in other fish. Meristic features did not deviate from the standard adopted for the roach. Individual variations of fertility of females were considerable and ranged from 12,480--334,464 eggs/female. Larvae of insects and filamentous algae constituted the main components of the content of the alimentary canal of the roach.--Copyright 1974, Biological Abstracts, Inc.
W76-00556

WATER REGIMEN OF SOME LEAF-BEARING EVERGREENS IN CONNECTION WITH THEIR OVERWINTERING AT THE BATUMI BOTANICAL GARDEN, (IN RUSSIAN),
N. M. Sharashidze.
Izv Batum Bot Sad Akad Nauk Gruz SSR, No 17, p 56-70. 1972.
Descriptors: Frost, *Leaves, Winter, Seasonal
Identifiers: Botanical gardens, *Evergreen
*USSR, *Frost resistance(Evergreens)

The water status was studied of leaves of ev
greens varying in geographic origin, ecologi
type, and frost resistance. The minimum conte
of total water was noted in the spring. In
summer the content of total water increased,
again decreased toward winter. At the end
spring the minimum content of bound water
found in the leaves. During the fall and winter
content of bound water increased. A direct
relation was not observed between the quantity
bound water and frost resistance when plants
different geographic origin were compar
Although the curves of the change of the conte
of bound water is nonuniform, during the win
the leaves contained less bound water than dur
the summer. It is concluded that an increase of
content of bound water in the winter promotes
increase of frost resistance--Copyright 19
Biological Abstracts, Inc.
W76-00568

AN ELECTRONIC LEAF WETNE RECORDER,
Agricultural Univ., Wageningen (Netherland
Stichting Technische en Fysische Dienst voor
Landbouw.
K. Schurer, and A. F. Van Der Wal.
Neth J Plant Pathol. Vol 78, No 1, p 29-32. 19
Illus.

Descriptors: *Leaves, *Plant diseases, Fu
*Moisture content, *Measureme
*Instrumentation, Electronic equipment.
Identifiers: Wetness.

Leaf wetness recording is important
epidemiological studies of plant diseases cau
by fungi. An insturment was constructed whic
capable of deriving the wetness signal direc
from leaves and producing a DC output at a le
compatible with other signals to be record
simultaneously. The recorder measures the elec
cal conductivity between a pair of electro
placed on the leaf. The circuit diagram is shown
field test conducted with the recorder proved s
cessful. Wetness due to rain and dew
recorded.--Copyright 1974, Biological Abstrac
Inc.
W76-00569

A FLEXIBLE APPARATUS FOR CONTINUO RECORDING OF WATER UPTAKE PLANTS,
Lund Inst. of Tech. (Sweden). Dept. of Electri
Measurements.
T. Brogardh, and A. Johnsson.
Med Biol Eng. Vol 11, No 3, p 286-292. 1973 Illu

Descriptors: *Instrumentation, *Root syste
*Water utilization, *Measurement.
Identifiers: *Apparatus, *Plants, *Water uptake

An apparatus for the continuous and automa
recording of water uptake by small plants or sin
shoots is described. The root system of the pl
(Or plants) to be investigated is submerged
water supply vessel. The water decrease in
vessel is detected, and the water is replaced
pumping new water into the vessel in a stepw
fashion. The apparatus can be used for measur
the total amount of water taken up, and the rate
water uptake. A water uptake of less than 0.1 m
can be reliably determined in the present appli
tions. An example from measurements of cyc
uptake of water by one single oat plant is given
Copyright 1974, Biological Abstracts, Inc.
W76-00571

ANNUAL CYCLE OF MAYFL (EPHEMEROPTERA) IN A KARSTIC STREA
Vysoka Skola Zemedelska, Ledn
(Czechoslovakia). Hydrobiological Station.

ukop.
Entomol Bohemoslov. Vol 70, No 2, p 81-85.

ptors: *Mayflies, *Biocass, Insects, ms, Europe.
iers: Czechoslovakia, Ephemeroptera, c streams, Trout streams.

nual changes in the abundance and biomass flies (Ephemeroptera) were investigated at ons on a karstic stream with a stony bottom. mber of species observed corresponded to given by other authors for Moravian oslovakia) trout streams. The annual e of abundance and biomass did not differ cantly from data published for Moravian streams. The total quantity of mayflies d significantly from the occurrence of a few s; the others occurred sporadically only and t show a significant effect on total quantita- alues. Developmental cycles of the most nt mayfly species found in the Krtiny river ponded to data concerning development cy- mid-European mayfly species. The highest of the mayfly biomass were found during months when larvae of the most frequent s of the Krtiny river matured.--Copyright Biological Abstracts, Inc.
0575

ATION AND DEVELOPMENT OF LAND- TIC VEGETATION IN SHALLOW RS OF THE DNIEPER, PRIPYAT AND REV FLORA PLAINS (IN UKRAINIAN),
miya Nauk URSR, Kiev. Instytut Botaniki.
Afanas'yev.
ot Zh. Vol 30, No 1, p 96-103, 1973. Illus. h summary).

ptors: *Reservoirs, *Aquatic plants, *Plant , Europe, Shallow water.
iers: Agrostis-Stolonizans, Alisma-Plan- quatica, Butomus-Umbellatus, Dnieper, aris-Palustris, Glyceria-Aquatica, nites-Communis, Pripyat, Schoenoplectus- ris, Sparganium-Polydrum, Teterev, -Angustifolia, Typha-Latifolia, USSR.

ce is presented on the Kiev (USSR) reser- aracter and initial vegetation that existed its filling. The factors determining the ways nation and development of groupings of the quatic vegetation in shallow waters are ed. Productivity of groupings of land- vegetation and the factors affecting its on are indicated. Prognosis of vegetation pment in shallow waters is given for the phase. Species discussed are: Agrostis zans, Glyceria aquatica, Butomus umbel- Sparganium polydrum, Alisma plantago- a, Typha latifolia, T. angustifolia, oplectus lacustris, Phragmites communis leocharis palustris.--Copyright (c) 1974, cal Abstracts, Inc.
0582

ALL MEASUREMENTS ABOVE AND IN ANOPY OF A MIXED OAK FOREST,
ls Univ. (Belgium). Laboratoire de que Systematique et d'Ecologie.
mary bibliographic entry see Field 2B.
0583

OPLANKTON AND EUTROPHICATION ME LAKES IN VESTFOLD, SOUTH NOR-
niv. (Norway). Inst. of Marine Biology; and niv. (Norway). Dept. of Limnology.
mary bibliographic entry see Field 5C.
0613

ECOLOGY OF THE LAKE FROG IN SOUTH-EASTERN KAZAKHSTAN. (IN RUSSIAN).
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Zoologii.
Izv Akad Nauk Kaz SSR Ser Biol. 1. p 52-57. 1973.

Descriptors: *Frogs, Amphibians, Wildlife, Animal growth, *Animal behavior, Lakes.
Identifiers: Ecology, Frog, Hibernation, Kazakhstan, Rana-ridibunda, USSR, Ili River.

Naturalistic observations of Rana ridibunda in the Ili River and Alma-Ata in 1968-1969 were compared with data obtained in other regions of southeastern Kazakhstan in 1952-1962. The lake frog propagates and develops in the low temperature regime of artificial reservoirs in this region, and this permits extension of its area of distribution from the south-east to the north-east. Adaptation of the southern species to marked temperature fluctuations permits tadpoles to hibernate at an early age in cold waters. Adult specimens eat mainly insects; harmful insects with larvae account fo 42%. Vertebrates account for 1-3%. R. ridibunda may be considered a useful species in south-eastern Kazakhstan.--Copyright 1974, Biological Abstracts, Inc.
W76-00637

DISCOVERY OF THE GASTROPOD SNAIL MELANOIDES (THIARA) TUBERCULATA (MULLER) IN FLORIDA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 5B.
W76-00660

EVAPOTRANSPIRATION,
Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 2D.
W76-00702

INFLUENCE OF SOIL-WATER POTENTIAL ON THE WATER RELATIONSHIPS OF HONEY MESQUITE,
Texas State Technical Institute, Amarillo.
For primary bibliographic entry see Field 2D.
W76-00703

PHYSIOLOGICAL RESPONSES OF SEMIARID GRASSES. III: GROWTH IN RELATION TO TEMPERATURE AND SOIL WATER DEFICIT,
Charleville Pastoral Lab. (Australia).
E. K. Christie.
Australian Journal of Agricultural Research, Vol 26, No 3, p 447-457, May, 1975. 8 fig, 4 tab, 21 ref.

Descriptors: *Grasses, *Semiarid climates, *Growth rates, *Plant physiology, *Moisture stress, Plant growth, Plant growth substances, Productivity, Soil-water-plant relationships, Water requirements, Air temperature, Soil moisture, Moisture availability, Phosphorus, Nutrients.
Identifiers: Mulga grass(Thyridolepis mitchelliana), Hoop Mitchell grass(Astrebla elymoides), Buffel grass(Cenchrus ciliaris L.).

The effects of temperature and soil water supply on mulga grass (Thyridolepis mitchelliana (Ness) S. T. Blake), hoop Mitchell grass (Astrebla elymoides F. Muell.ex F. M. Bailey) and buffel grass (Cenchrus ciliaris L.) are discussed. The optimum temperature for growth was about 25C for mulga grass, and 30C for Mitchell and buffel grass. Buffel grass had the highest yield at all temperatures which is attributed to its higher growth rate, higher assimilation rate and the diversion of a greater proportion of dry weight into leaf area. Seedlings with an adequate supply of phosphate had higher relative growth rates than phosphorus-deficient seedlings at the commencement of the soil drying cycle, but their growth rates declined more rapidly as soil water potential fell. This was associated with a reduction in the rate of phosphate absorption as well as a decrease in tissue phosphorus concentration. (Robinett-Arizona)
W76-00704

WATER POTENTIALS OF SALSOLA KALI L. AT DIFFERING LEVELS OF SUBSTRATE WATER AVAILABILITY,
Forest Service (USDA), Odgen, Utah. Intermountain Forest and Range Experiment Station.
W. T. McDonough.
Plant and Soil, Vol 42, No 2, p 387-393, April, 1975. 3 fig, 7 ref.

Descriptors: *Plant physiology, *Germination, *Plant growth, *Water requirements, *Turgidity, Growth stages, Moisture stress, Plant growth, Water balance, Moisture availability, Moisture uptake, Osmotic pressure, Hygrometry, Moisture content, Root development, Plant tissues, Weeds, *Utah.
Identifiers: Water potential, *Russian thistle(Salsola Kali L.), Wasatch Range(Utah).

Isolated embryos of Salsola Kali L. (Russian thistle) were allowed to imbibe on filter paper in Peltier thermocouple psychrometer chambers with differing amounts of water available. Water potential determinations made on the system periodically during the 24 hour period of imbibition showed that at the 24th hour, complete extension of the embryonic axis occurred at an equilibrium water potential of -2 bars and an embryo water content of 114%, perceptible growth (uncoiling of the spiraled embryo) at -30 bars and 83%, and no growth or perceptible swelling at -54 bars and 56%. In Salsola, evidence of growth occurs at water potentials well below those that permit germination in other species investigated, and extensive growth occurs in about the same range as root protrusion in the other species investigated. Hourly monitoring of the water potential of the plant-substrate system showed an initial rise toward a level that would be attained by the wetted filtered paper alone and then a decline to lower water potential values at intermediate levels of water availability. This reversal is ascribed to the increasing effects of the osmotic and matric components of the total water potential of the plant tissue during imbibition and growth. (Robinett-Arizona)
W76-00705

RESPONSE TO THREE SEMIDWARF MEXICAN WHEATS TO DIFFERENT AERATION CONDITIONS IN THE ROOTING MEDIUM AT A CONSTANT SALINITY LEVEL,
Escuela Nacional de Agricultura Chapingo (Mexico).
For primary bibliographic entry see Field 3C.
W76-00710

BIOLOGICAL PRODUCTIVITY OF HERBACEOUS PHYTOCENOSES OF THE AMU DAR'YA FLOOD LANDS. (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
A. I. Gladyshev.
Izv Akad Nauk Turkm SSR ser Biol Nauk. 2 p 38-45, 1973. Illus. (English summary).

Descriptors: *Flood plains, *Plant growth.
Identifiers: Amu-Darya River, *Phytocenoses, USSR.

Perennial herbaceous plants, determining the structure of vegetational cover of the Amu Dar'ya (USSR) middle stream flood lands, can accumulate exclusively high phytomass (From 7.7-121.9t/ha dry matter); total stock of the organic matter reaches 138.8t/ha.--Copyright 1974, Biological Abstracts, Inc.
W76-00711

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DROUGHT TOLERANCE OF PINE SEEDLINGS UNDER VARIOUS CLIMATIC CONDITIONS,
Agricultural Research Organization, Dor (Israel). Div. of Forestry.
D. Heth, and P. J. Kramer.
Forest Science, Vol 21, No 1, p 72-82, March, 1975. 5 fig, 5 tab, 25 ref.

Descriptors: *Osmotic pressure, *Moisture stress, *Plant physiology, *Pine trees, *Plant growth, Leaves, Drying, Turgidity, Moisture availability, Transpiration, Droughts, Arid lands, Loblolly pine trees, Planting management, Temperature, Thermal stress, Humidity, Soil moisture, Soil-water-plant relationships.
Identifiers: Shortleaf pine(Pinus echinata), Monterey pine(Pinus radiata D. Don), Pinus taeda L.

The ability to avoid severe desiccation during periods of increasing soil moisture stress is critical for survival of drought by pine seedlings. Tolerance of water stress by seedlings was evaluated under 4 combinations of temperature and humidity in controlled environment chambers. The survival ability of seedlings after cessation of watering was strongly related to temperature and humidity; survival being highest in the most cool environment and lowest in the hot dry environment. Soil water potential at seedling death was lowest for Monterey pine (Pinus radiata D. Don) in all 4 environments and lowest in the moist cool environments. Soil water potential at seedling death was lowest for shortleaf pine (P. echinata) and loblolly pine (P. taeda L.) in the moist warm environment. Monterey pine appeared to be most drought tolerant as measured by soil water potential at seedling death in all but the moist warm environment in which there was little difference among the 3 species. (Robinett-Arizona)
W76-00712

THE VALUE OF VEGETATION FOR CONSERVATION I. FOUR LAND AREAS IN BRITAIN,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
D. R. Helliwell.
Journal of Environmental Management, Vol 2, No 1, p 51-74, January 1974. 1 fig, 4 tab, 5 ref, append.

Descriptors: *Vegetation effects, *Vegetation, Conservation, *Plant populations.
Identifiers: *England.

Lists of plant species and their relative frequency have been used, in conjunction with the 'Atlas of the British Flora', to compare the conservation 'value' of the vegetation on four different areas of land in Britain. A wide range of assumptions as to the weighting to be given to the rarity of species gives very similar results in each case. (See also W76-00737) (Skogerboe-Colorado State)
W76-00736

THE VALUE OF VEGETATION FOR CONSERVATION II. M1 MOTORWAY AREA,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
D. R. Helliwell.
Journal of Environmental Management, Vol 2, No 1, p 75-78, January 1974. 1 fig, 1 ref.

Descriptors: *Vegetation effects, *Vegetation, Conservation, *Plant populations.
Identifiers: *England.

A list of plant species occuring along 175 miles (282 km) of motorway embankment has been used in an attempt to compare the conservation 'value' of this vegetation with four other areas of vegetation, but it is concluded that such a comparison is not possible. (See also W76-00736) (Skogerboe-Colorado State)
W76-00737

INCREASING INTENSIFICATION OF PLANT PRODUCTION AND THE PROBLEM OF CHANGES IN THE NATURAL ENVIRONMENT,
Polish Academy of Sciences, Warsaw. Inst. on Agricultural and Forestry Economics.
For primary bibliographic entry see Field 5B.
W76-00766

DROUGHT-STRESS AVOIDANCE IN THREE PIONEER TREE SPECIES,
Union Coll., Schenectacy, N. Y. Dept. of Biology.
T. M. Kana, and P. Tobiessen.
Ecology, Vol 55, No 3, p 667-670, 1974. Illus.

Descriptors: *Stomata, *Water loss, Drought, Tolerance.
Identifiers: Fraxinus Americana, Populus Grandidentata, Populus Tremuloides.

Leaf resistance to water vapor flow was determined relative to leaf-water potential for white ash, quaking aspen, and bigtooth aspen (Fraxinus americana, Populus tremuloides, P. grandidentata). Ash leaves were found to close their stomata at approximately -20 bars and bigtooth aspen leaves at approximately -30 bars, whereas quaking aspen maintained low leaf resistance to -60 bars. This lack of control of water loss is suggested as a possible reason for the apparent moist site preference for quaking aspen in the study region. Bigtooth aspen may be able to survive in more xeric habitats than ash because of the latter's high leaf-water potential for stomatal closure.--Copyright 1974, Biological Abstracts, Inc.
W76-00872

PATHOLOGICAL CHANGES OBSERVED IN FISHES FOLLOWING POISONING BY GRANULATED HERBICIDES-ATRAZINE AND DIURON: RAPID DETERMINATION OF THE TOXICITY OF LOW PESTICIDE CONCENTRATIONS (IN RUSSIAN),
K. R. Martino.
Tr Kasp Nauchno-Issled Inst Rybn Khoz, 26, p 245-249, 1971.

Descriptors: *Fish, Pesticides, *Fishkill, *Herbicides, Diseases, Fish diseases, *Pesticide toxicity.
Identifiers: Atrazine, Diuron, Granulation herbicides, Liver, Rudd, Scardinius-erythrophthalmus, Necrosis.

The effect of low concentrations of the granulated herbicides atrazine and diuron on the rud (Scardinius erythrophthalmus) was studied. The experiments were set up under aquarium conditions using fish in the IV and V stages of maturity. Change of behavioral sterotypes were determined on the basis of 4 indices: defense reflex, response to food, localization of the fish in the bottom or surface waters, and presence or absense of the schooling instinct. At the end of 8-9 days the fish were subjected to hematological and pathohistological investigations. At the minimum tested concentrations of atrazine and diuron (0.64 mg/l) the behavior of the experimental fish did not differ from that in controls. However, destruction of erythrocytes was noted in the blood and edema and cloudy swelling progressing to necrosis were observed in the liver. The experiments demonstrated the unsuitability of these herbicides for fish farms and the possibility of rapid determination of the toxicity of various pesticides.--Copyright 1974, Biological Abstracts, Inc.
W76-00995

SOME EFFECTS OF SOIL TYPE AND WATER REGIME ON GROWTH OF TUPELO SEEDLINGS,
Forest Service (USDA), Charleston, S.C. Southeastern Forest Experiment Station.
W. R. Harms.
Ecology, Vol 54, No 1, p 188-193, 1973, Illus.

Descriptors: *Soil water plant relationships, Soil water, Plant growth, Stagnant water.
Identifiers: Nyssa aquatica, Nyssa sylvatica, Tupelo, Tree seedlings.

Two year-old swamp tupelo (Nyssa sylvatica var biflora (Walt.) Sarg.) and water tupelo (N. aquatica L.) grown in large tanks in a silty clay loam soil from a river swamp or a sandy loam soil from a non-alluvial headwater swamp were subjected to continuous flooding at depths of 20 cm above the soil surface with moving water, 20 cm above the soil surface with stagnant water, or at the soil surface with moving water. Height growth of water tupelo averaged 1.8 times greater and dry weight 3 to 3 times greater in the more fertile soil from the river swamp than in soil from the headwater swamp. Soil type had no effect on growth of swamp tupelo. Growth and dry weight of both tupelos were poorest in the regime with stagnant water, which also had the highest CO2 and lowest O2 contents. Swamp tupelo grew 50 cm more in height in the surface flooded regime with moving water than in either deep-flooded regime. Water tupelo in both regimes with moving water grew 3 cm taller than those in the stagnant regime.--Copyright 1973, Biological Abstracts, Inc.
W76-00999

2J. Erosion and Sedimentation

A DUAL-INTERVAL, LIGHT-ACTIVATED SIGNAL GENERATOR--ITS APPLICATION TO SEDIMENT SAMPLING,
Agricultural Research Service, Chickasha, Okla.
C. D. Edens, and D. G. DeCoursey.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 3, p 505-507, May-June 1975. 4 fig, 1 tab.

Descriptors: *Instrumentation, *Sediment, *Sampling, Measurement, Data collection, Hydrologic data, Water table, Electronic equipment, Water levels.
Identifiers: Optical instruments, Light-activated devices, Signal generator.

Since records of sediment in the field are not available on a continuous basis, water samples must be collected periodically and analyzed for concentration. The device described was less expensive improvement over available stage and time-activated methods of determining when samples should be taken. To signal the sampler, the device uses light-sensitive rectifiers, activated by light shining through the holes in a disc mounted on the stage recorder. (Lee-ISWS)
W76-00543

EROSION IN THE URBAN ENVIRONMENT,
Johns Hopkins Univ., Baltimore, Md.
M. G. Wolman.
Hydrologic Sciences Bulletin, Vol 20, No 1, p 115-125, March 1975. 1 tab, 17 ref.

Descriptors: *Erosion, *Erosion rate, *Urbanization, *Sedimentation, Urban runoff, Rill erosion, Sheet erosion, Soil erosion, Channel erosion, Sediment load, Water quality, Turbidity, Erosion control, Sediment yield, Construction, Urban hydrology, Environmental effects, Land development.

Urbanization and accompanying construction increase erosion rates from five to 200 times or more in the eastern United States. Sediment yields of streams increase by comparable amounts. Data from the United Kingdom, Japan, Canada, and Mexico suggest roughly similar ranges. Increased discharge from urban areas combined with increases in sediment concentration on the order of 2 to 50-fold are demonstrated in individual storms and in seasonal and annual variations in the United Kingdom. Potential for erosion below dams parallels a similar potential from urbanized areas af

ion. Nomograms relating area under con-
, basin area, and erosion rates provide
ols for management. Additional informa-
eded on sediment transport by storm rain-
arying frequency and magnitude, on accu-
and movement of sediment in channels
very of stream biota, and on channel en-
t resulting from urbanization. (Terstriep-
46

ION RATES IN VALLEYS DETER-
USING FALLOUT CESIUM-137,
ral Research Service, Oxford, Miss.
ation Lab.
nie, P. H. Hawks, and J. R. McHenry.
l Society of America Bulletin, Vol 86,
128-1130, August 1975. 4 fig, 1 tab, 24 ref.
T-(49-7)-3029.

rs: *Sedimentation rates, *Radioactivity
s, *Mississippi, Fluvial sediments,
n(Sediments), Sediment transport, Fal-
uvium, Cesium Radioisotopes, Valleys,
nent, Data collections.
s: *Cesium-137, Geochronology.

man's cultural activities have accelerated
ition of sediment in valleys, yet in most
se rates are low and difficult to measure.
profiles collected in northern Mississippi
ge of deposition rates from 0.9 to 6.5
determined using fallout cesium-137.
position rates were similar to rates deter-
ong these same ranges using survey
s. (Lee-ISWS)
7

AVES AND BEACH CUSPS,
nstitution of Oceanography, La Jolla,

ry bibliographic entry see Field 2L.
8

OLOGIC ASSESSMENT OF THE SEP-
14, 1974, FLOOD IN ELDORADO
, NEVADA.
l Survey, Reston, Va.
ry bibliographic entry see Field 2E.
3

UTION OF RADIONUCLIDES IN THE
IA RIVER STREAMBED, HANFORD
ATION TO LONGVIEW, WASHING-

l Survey, Reston, Va.
ry bibliographic entry see Field 5B.
4

ITIAL WATER STUDIES ON SMALL
MPLES, LEG 22,
l Survey, Woods Hole, Mass.
ry bibliographic entry see Field 2L.
5

T EXCHANGE IN WATER-SEDI-
NTERFACE AND ITS EFFECTS ON
UALITY,
and Univ., Kingston. Dept. of Civil and
ental Engineering.
ry bibliographic entry see Field 5C.
5

OMATIC PUMPING SAMPLER FOR
TING THE TRANSPORT OF PESTI-
SUSPENDED SEDIMENT,
ry bibliographic entry see Field 5B.
3

MAGIC ISLAND...TEN YEARS AFTER,
Belt, Collins and Associates Ltd., Honolulu, Hawaii.
For primary bibliographic entry see Field 8A.
W76-00889

VOLUMETRIC CHANGES IN BEACH PROFILES,
Glamorgan Polytechnic, Pontypridd(Wales).
For primary bibliographic entry see Field 2L.
W76-00890

LAKE STREAM CONTRVERSY: A FINAL DECISION,
For primary bibliographic entry see Field 6E.
W76-00927

DEPARTMENT OF NATURAL RESOURCES V MAYOR AND COUNCIL OF OCEAN CITY (ACTION BY OWNER OF LAND TO REAR OF OCEAN FRONT TRACT TO ENJOIN CONSTRUCTION OF CONDOMINIUM).
For primary bibliographic entry see Field 6G.
W76-00936

MAJOR FLOODS, POOR LAND USE DELAY RETURN OF SEDIMENTATION TO NORMAL RATES,
Forest Service (USDA), Berkely, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-00989

2K. Chemical Processes

THE EFFECTS OF STREAM CHANNELIZATION OF THE DISTRIBUTION OF NITRIENTS AND METALS,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-00501

ALKALINITY CALCULATIONS IN WATER,
Kiriat-Yam 'G', Haifa (Israel).
A. Zonker.
Water and Sewage Works, Reference Number, p R162-R163, April 30, 1975. Revised by H. G. Swope. 1 fig, 1 tab, 1 ref.

Descriptors: *Analytical techniques, *Water analysis, *Alkalinity, Chemical analysis, Bicarbonates, Carbonates, Alkalis(Bases), *Volumetric analysis, Pollutant identification.
Identifiers: Nomagraphs.

The simple, classical method of alkalinity determination in water is based on double titration with acid. Phenolphthalein and methyl orange are used to indicate the titration end points. A well known table of values may be obtained by using 100 ml of water an 0.02N acid as a titrant, and determining P as the quantity of acid consumed from the beginning to the phenolphthalein end point, and T as the quantity of acid consumed from he beginning to the methyl orange end point. A nomograph is presented which includes these possibilities. By connecting the known values of P and T, one can determine the concentration of hydroxides, carbonates, and bicarbonates. Several examples are give. Since the nomograph is based on a 100 ml sample and 0.0200N acid, care must be taken to insure that the test acid has the exact normality and corrections must be made for samples of less than or more than 100 ml. (Orr-FIRL)
W76-00599

GROUND-WATER QUALITY IN INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-00658

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES-UPPER COLORADO REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-00662

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 22,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 2L.
W76-00665

MAP SHOWING AVAILABILITY OF HYDROLOGIC DATA PUBLISHED AS OF 1974 BY THE U.S. ENVIRONMENTAL DATA SERVICE AND BY THE U.S. GEOLOGICAL SURVEY AND COOPERATING AGENCIES, COLORADO SPRINGS-CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-00669

A SURVEY OF THE BORON CONTENT OF CERTAIN WATERS OF THE GREATER LONDON AREA USING A NOVEL ANALYTICAL METHOD,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
For primary bibliographic entry see Field 5A.
W76-00727

ENVIRONMENTAL ISOTOPIC STUDY OF THE BARREMIAN-JURASSIC AQUIFER IN SOUTH DOBROGEA (ROUMANIA),
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2F.
W76-00894

OCCURRENCE AND DISTRIBUTION OF POTASSIUM IONS IN NATURAL WATERS IN INDIA,
Soil Research Lab., Chandigarh (India).
For primary bibliographic entry see Field 5B.
W76-00897

PRECIPITATION: ITS ACIDIC NATURE,
Pittsburg Univ., Pa. Dept. of Occupational Health.
J. O. Frohliger, and R. Kane.
Science, Vol. 189, No. 4201, p 455-457, August 8, 1975. 2 tab, 5 ref.

Descriptors: *Chemistry of precipitation, *Precipitation(Atmospheric), *Acidity, *Pennsylvania, Chemistry, Rain, Snow, Acids, Chemical analysis, Water chemistry, Hydrogen ion concentration, Sampling, Pollutant identification.

A comparison of the free hydrogen ion concentration and the total hydrogen ion concentration of rain samples showed that rain is a weak acid. The weak acid nature of rain casts doubt on the concepts that the acidity of rain is increasing and that these increases are due to strong acids such as sulfuric acid. (Sims-ISWS)
W76-00900

2L. Estuaries

AN OCEANOGRAPHIC RESEARCH PROGRAM FOR THE CONTINENTAL SHELF OFF THE SOUTHEASTERN UNITED STATES.
Division of Biomedical and Environmental Research (USERDA), Washington, D.C.

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Available from the National Technical Information Service, Springfield Va 22161. ERDA-12, Proceedings of the Workshop, Savannah River Laboratory, Aiken, South Carolina, October 8-9, 1974. 35 p, 2 fig.

Descriptors: *Oceanography, *Continental shelf, *Oceans, *Southeast U. S., Continental slope, Atlantic Ocean, Marine biology, Ocean circulation, Ocean currents, Physical properties, Tides, Estuaries, Sediment transport, Nutrients, Environmental effects, Radioactivity, Offshore platforms, Background radiation, Project planning, Project feasibility, Planning, Research priorities, *Research and development.
Identifiers: Offshore nuclear powerplants.

On October 8-9, 1974, 41 oceanographers from the southeastern United States gathered at the Savannah River Laboratory, Aiken, South Carolina, to recommend the elements of a unified research program that would contribute to a better understanding of the ocean system over the continental shelf south of Cape Hatteras. The effort was an experiment with two objectives: (1) to bring together a cross-section of oceanographers familiar with the existing and past oceanographic research on the southeastern continental shelf and to allow some interaction across the disciplines; and (2) to provide guidance to the AEC and its successor, the Energy Research and Development Administration (ERDA), on what types of oceanographic research programs could be reasonably undertaken in the southeast with constraints in funding and time. Four groups were formed: Physical Oceanography, Sediment Transport, Geochemical Transport, and Biological Oceanography. The ultimate long-term objective for ERDA is to fund research programs that would assess the impact of offshore nuclear power reactors and other energy-related activities in the environment of the southeastern continental shelf. However, the working objective of the groups in the workshop was to design a research program that would enhance our understanding of the system. This is prerequisite for separating out the abnormal working of the system caused by man-made impact from the 'normal' working of the system before energy-related activities are initiated. Each group was requested to place priorities on the scope of their research, implying recognition, a priori, that every conceivable problem could not be attacked in depth. (Sims-ISWS)
W76-00533

THE MEDITERRANEAN OUTFLOW--A SIMPLE ADVECTION-DIFFUSION MODEL,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. L. Richardson, and K. Mooney.
Journal of Physical Oceanography, Vol 5, No 3, p 476-482, July 1975. 6 fig, 17 ref. ONR N00014-68-A-0215-0003, N00014-74-C-0262 (NR083-004).

Descriptors: *Ocean currents, *Salinity, *Advection, *Mixing, *Circulation, *Atlantic Ocean, Mathematical models, Velocity, Diffusion, Oceans, Distribution.
Identifiers: Peclet number, *Mediterranean water tongue, Salinity anomalies.

The influence of the subtropical gyre on the spread of Mediterranean water in the Atlantic was discussed in terms of a simple horizontal advection-diffusion model. The northern, southern, and western boundaries of a rectangular ocean were treated as salt sinks while the distribution of salinity on the east coast representing the highly saline Mediterranean water was represented as a sine curve. The velocity distribution for the subtropical gyre was that given by Stommel and included westward intensification. Salinity distributions were calculated for various values for the Peclet number, and for oceanographically reasonable values they indicated that the gyre passed through the high-salinity tongue and advected it toward the south and west. The model was consistent with the observed salinity distribution of the mid-layers of the North Atlantic. (Adams-ISWS)
W76-00544

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering, and Massachusets Inst of Tech , Cambridge Ralph M Parsons Lab for Water Resources and Hydrodynamics
For primary bibliographic entry see Field 5B.
W76-00545

THE THEORY OF WAVE PROPAGATION IN WATER OF GRADUALLY VARING DEPTH AND THE PREDICTION OF BREAKER TYPE AND HEIGHT,
Oregon State Univ., Corvallis. School of Oceanography.
M. K. Gaughan, and P. D. Komar.
Journal of Geophysical Research, Vol 80, No 21, p 2991-2996, July 20, 1975. 9 fig, 8 ref.

Descriptors: *Ocean waves, *Waves(Water), *Beaches, Analysis, Theoretical analysis, Coastal engineering, Hydrodynamics, Height, Depth, Wavelengths, Profiles, Coasts.
Identifiers: *Breaking waves, *Wave steepness, Breaking depth.

Biesel's theory of wave propagation in water of gradually varying depth was applied to determine the dependence of breaker type (plunging or spilling) on beach slope and on deep water wave steepness, the ratio of the wave height to the wave length. With the fluid motion at the surface represented in Lagrangian coordinates, a graph was developed for the breaker type on the basis of 21 combinations of beach slope and deep water wave steepness. Comparison with laboratory wave tank data on breaker types showed good agreement with the theoretically-based graph. The steepening of the shoaling wave profile on the shoreward wave face resulted in the occurrence of a vertical surface. The first appearance of such a vertical surface provided a natural breaking criterion compatible with experimental usage. Using this breaking criterion, the ratios of breaking wave height to deep water wave height to depth at the breaking point were theoretically evaluated. The dependence of the ratio of breaking weave height to deep water wave height on the deep water wave steepness was correctly demonstrated by the theory. (Adams-ISWS)
W76-00557

EDGE WAVES AND BEACH CUSPS,
Scripps Institution of Oceanography, La Jolla, Calif.
R. T. Guza, and D. L. Inman.
Journal of Geophysics Research, Vol 80, No 21, p 2997-3012, July 20, 1975. 10 fig, 2 tab, 54 ref. NOAA USDC 2-35208.

Descriptors: *Waves(Water), *Beach erosion, *Resonance, *Coasts, Shores, Ocean waves, Beaches, Laboratory tests, Analysis, Geomorphology, Theoretical analysis, On-site data collections.
Identifiers: *Edge waves, *Beach cusps, *Wave reflection.

The spacings of some beach cusps formed under reflective wave conditions both in the laboratory and in certain natural situations were shown to be consistent with models hypothesizing formation by: (1) subharmonic edge waves (period twice that of incident waves) of zero mode number, or (2) synchronous edge waves (period equal to that of incident waves) of low mode. Laboratory experiments showed that visible subharmonic edge wave generation occurred on nonerodable plane beaches only when incident waves were strongly reflected at the beach. Edge wave resonance theory and experiments suggested that synchronous potential edge wave generation could occur on reflec beaches and would have a higher-order, we resonance than the subharmonic type. In dis tive systems, modes of longshore periodic mo other than potential edge waves have been fo to be important. On reflective plane labora beaches, initially large subharmonic edge w rearranged sand tracers into shapes resemb natural beach cusps, but the edge wave amplit decreased as the cusps grew. Cusp growth limited by negative feedback from the cusps t edge wave excitation process. Small edge w formed longshore periodic morphologies providing destablizing perturbations on a b located in the swash zone. In this case, the ret ing incident wave surge was channelized breeches in the berm caused by the edge wa and initial feedback from the topography t longshore periodic perturbations was pos (Adams-ISWS)
W76-00558

SALT WATER INTRUSION INTO POR MEDIA,
S. V. Regional Coll. of Engineering and Techn gy, Surat (India)
R. N. Shelat, P. R. Mehta, and G. G. Patel.
Journal of the Institution of Engineers (India), 55, Part PH 2, p 55-60, February, 1975. 8 fig, 7

Descriptors: *Model studies, *Saline wate trustion, Encroachment, *Aquifers, Interfa Recharge, Saline water-freshwater interfa Subsurface waters, Hydrology, *Porous m Groundwater.

Experimental model studies were performed t vestigate some aspects of subsurface salt wat trusion. The problem of salt water intrustion coastal aquifers is essentially a problem stratified fluid flow in porous strata. A boun surface or interface is formed wherever the fluids (freshwater and seawater) are in con The experimental apparatus comprised a H shaw model, pumping arrangement, and trolling devices. The model consisted of pieces of 12 mm thick plate glass spaced ab mm apart and connected to a reservoir consi of 20 cm x 20 cm x 70 cm high perspex she either end. A well defined interface bet lighter and heavier fluids was shown and Ghyben-Herzberg relationship was satisfie type of mixing distinct from diffusion occurr the interface whenever the interface shifted. wedge front velocity was determined to be i sely proportional to wedge length and also de dent upon the inclination of impervious bed density of the intruding fluid. The fresh w piezometric surface must be above the mea level a distance equal to S minus one time distance below sea level to the lowest pum zone which must be protected in order to pre sea water intrusion into coastal aquifer, where the specific gravity of sea water. For an aquif finite thickness, the maintenance of fresh w surface above sea level will result in seaward of fresh water. The relationship between equilibrium wedge length and the rate of sea flow of fresh water is independent of the dist of the aquifer below sea level. Correction in draft conditions by suitable recharge is a fea method to check the intrusion. (Orr-FIRL)
W76-00614

INTERSTITIAL WATER STUDIES ON SM CORE SAMPLES, LEG 22,
Geological Survey, Woods Hole, Mass.
F. T. Manheim, L. S. Waterman, and F. L. Say
In: Initial Reports of the Deep Sea Drilling ject, Vol 22, National Science Foundation, p 662, 1974: Washington, DC, U.S. Govern Printing Office. 6 p, 1 fig, 2 tab, 2 ref.

Descriptors: *Connate water, *Indian Oc *Sediments, *Core drilling, *Water types, pling, Data collections, Geologic

mistry, Chemical analysis, Subsurface Geologic formations, Sedimentology, Pore aline water.
ers: *Intersititial water.

ial waters from Leg 22 in the Indian Ocean two unique results: Site 214, on the ast Ridge, penetrated through a 30-meter e of fine-grained basalt and reentered ilty clay containing carbonate skeletal Such a basalt layer may well have been im- and extensive enough to seal off underly- il) seawater of Paleocene age. However, or a marked increase in calcium and a crease in chloride, no appreciable changes fluid chemistry could be confirmed. Site the northernmost end of the Nintyeast emonstrated record concentrations of in- calcium in clayey nanofossil oozes and a y small but signficant increment in with depth. Presumably, these increments ie existence of evaporitic sediments or e-influenced brines at considerable epth than penetrated. (Woodard-USGS)
65

NT EXCHANGE IN WATER-SEDI- INTERFACE AND ITS EFFECTS ON QUALITY,
land Univ., Kingston. Dept. of Civil and nental Engineering.
ary bibliographic entry see Field 5C.
15

G BEHAVIOR IN RELATION TO SUB- AND TEMPERATURE IN THE HER- AB, PAGURUS LONGICARPUS,
l Univ., Princess Anne. Dept. of Biology.
n.
Vol 55, No 1, p 195-198, 1974, Illus.

ors: *Migration, *Crabs, Water tempera- nal behavior.
s: Narragansett Bay, Pagurus longicar-

longicarpus migrates in autumn from a stuary to deeper waters of Narragansett ode Island(USA), when ambient water ures are between 10 and 4 C. Critical ther- mum experiments indicated that crabs comotor activity at approximately 3 C ing response at 1.5 C. When presented rnt substrates, crabs used their walking occasionally, their chelae to scoop a n in the substrate. They were not able to a proper depression in gravel and, hey succeeded in burying themselves in and sand, they remained buried only in ter dredging seaward of an estuary in mit crabs were found in summer showed est density of crabs at 16-18 m water ried in fine sand. No crabs were found away at 20 m on a silty mud bottom. The perature was less than 2 C in all areas As environmental temperatures hermit crabs probably move into deeper bury themselves in regions of sandy bot- wintering in this manner might decrease ion of hermit crabs by benthic organisms crabs are in a state of torpor.--Copyright gical Abstracts, Inc.
9

OF SALMON CANNERY WASTES ER QUALITY AND MARINE ORGAN-

n Univ., Seattle. Fisheries Research

y bibliographic entry see Field 5C.

SES OF SOUTH-WESTERN AUS- VITH SPECIAL REFERENCE TO THE

ECOLOGY OF POSIDONIA AUSTRALIS HOOK F. IN A POLLUTED ENVIRONMENT,
Western Australia Univ., Nedlands. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-00870

MERCURY IN FISH IN THE DERWENT ESTUARY, TASMANIA, AND ITS RELATION TO THE POSITION OF THE FISH IN THE FOOD CHAIN,
Commonwealth Scientific and Industrial Research Organization, Hobart Australia. Tasmanian regional.
For primary bibliographic entry see Field 5A.
W76-00871

BACTERIOLOGICAL STUDIES OF WICOMICO RIVER SOFT-SHELL CLAM (MYA ARENARIA) MORTALITIES,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-00873

CAUSES OF DECREASE AND DISAPPEARANCE OF THE SEAGRASS POSIDONIA OCEANICA ON THE FRENCH MEDITERRANEAN COAST (CAUSES DE LA RAREFACTION ET DE LA DISPARATION DES HERBIERS DE POSIDONIA OCEANICA SUR LES COTES FRANCAISES DE LA MEDITERRANEE),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5B.
W76-00876

TRACE METAL LEVELS IN BEACH DIPTERANS AND AMPHIPODS,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5A.
W76-00877

ANNUAL REPORT 1974.
New South Wales Univ., Kensington(Australia). Water Research Lab.
For primary bibliographic entry see Field 9C.
W76-00883

MAGIC ISLAND...TEN YEARS AFTER,
Belt, Collins and Associates Ltd., Honolulu, Hawaii.
For primary bibliographic entry see Field 8A.
W76-00889

VOLUMETRIC CHANGES IN BEACH PROFILES,
Glamorgan Polytechnic, Pontypridd(Wales).
A. T. Williams.
Shore and Beach, Vol. 42, No. 2, p 23-28, October 1974. 8 fig, 7 ref.

Descriptors: *Beaches, *Erosion, *Waves(Water), *Bays, *Winds, *Typhoons, Tides, Cyclones, Deposition(Sediments), Wind tides, Currents(Water), Asia.
Identifiers: *Longshore current, *Accretional changes, *Hong Kong Island, Swells.

Three beaches located on Hong Kong Island were investigated with regard to monthly changes in beach profiles. At each of the beaches two profiles were measured. The study was concerned with accretional and erosional changes that took place between successive survey periods. For one of the beaches, the maximum vertical profile changes recorded were nearly one meter. During the 1970 and 1971 surveying seasons the bulk of the tropical cyclones affecting Hong Kong generated low swells, and these rather than the influence of onshore and offshore winds during the summer appeared to be the dominant influence on beach changes. Sediment removal by large typhoonal wave attack was rapid, but in the study period little beach sediment was removed. The changes recorded confirmed impressions of seasonal reversals of beach processes. The beaches were in a state of dynamic equilibrium so that fears of permanent sediment removal were probably groundless. (Bhowmik-ISWS)
W76-00890

MODE TIDES,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
B. Zetler, W. Munk, H. Mofjeld, W. Brown, and F. Dormer.
Journal of Physical Oceanography, Vol. 5, No. 3, p 430-441, July 1975. 2 fig, 4 tab, 15 ref, 1 append. ONR N00014-69-A-0200-6008, NSF GX-29052.

Descriptors: *Tides, *Atlantic Ocean, *Ocean currents, Measurement, Analysis, Analytical techniques, Diurnal, Currents(Water), Oceanography.
Identifiers: *MODE, Bottom pressures, Deep-sea tides, Gravitational tides, Radiational tides, Tidal currents.

Bottom pressure measurements at four MODE stations constitute a unique set of deepsea tidal measurements. A response analysis relative to a Bermuda reference has been optimized with regard to the number of complex weights and the makeup of gravitational and radiational inputs. Duplicate instrumentation on EDIE capsule gave 32.067, 2.5 degrees; 32.074, 2.6 degrees for M sub 2 amplitude (cm) and Greenwich epoch, thus attesting the reality of measured small station differences (order 1 cm, 1 degree). M sub 2 tidal currents (calculated from the M sub 2 surface and bottom slopes) have u and v speeds of 0.5 and 0.8 cm/s, respectively, in rough agreement (both amplitude and phase) with preliminary estimates from current measurements. M sub 2 and K sub 1 tides are in accord with some existing cotidal and corange charts. M sub 3 tides are a fraction of equilibrium magnitude, whereas M sub 4, M sub 5, and M sub 6 (typically 0.07, 0.05, 0.03 cm) vastly esceed equilibrium values. Presumably these overtides are generated by nonlinear coupling in the world's shallow basins, from where they radiate into the global oceans to attain a level where radiative and dissipative processes are somehow balanced. (Sims - ISWS)
W76-00905

SEASONAL VARIATION IN TRANSPORT OF THE PACIFIC NORTH EQUATORIAL CURRENT RELATIVE TO THE WIND FIELD,
Hawaii Univ., Honolulu. Dept. of Oceanography.
G. Meyers.
Journal of Physical Oceanography, Vol. 5, No. 3, p 442-229, July 1975. 6 fig, 1 tab, 25 ref. ONR N00014-67-A-0387-0017.

Descriptors: *Ocean currents, *Winds, *Thermocline, *Pacific Ocean, Measurement, Surveys, Sampling, Movement, Ocean circulation, Water circulation, Oceans, Model studies, Meteorology, Oceanography.
Identifiers: *Ekman pumping, Trade winds, Volume transports.

Geostrophic transports in the upper 300 m relative to 1000 db were computed from observations along four meridional sections occupied monthly during the Trade Wind Zone Oceanography Study, February 1964 to June 1965. Transports varied from a minimum of about 11,000,000, cu m/s in February of both 1964 and 1965 to a maximum of 23,000,000 cu m/s in September 1964. The ridge in the thermocline at the southern edge of the current rose or fell simultaneously as the transport increased or decreased. Theoretical vertical dis-

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placements were computed from the wind stress curl. The observed vertical displacements of the thermocline were similar to the computed displacements. Thus, the observations of the Trade Wind Zone Oceanography Study are in agreement with a simple model of variation in the strength of equatorial currents. According to the model, the divergence of Ekman transports causes variation in the meridional slope of the thermocline and in the geostrophic current speed. (Sims - ISWS)
W76-00906

MOVEMENT OF SURFACE DRIFTERS IN THE AMERICAN MEDITERRANEAN,
Connecticut Univ., Groton. Marine Sciences Inst.
D. L. Murphy, D. F. Paskausky, W. D. Nowlin, Jr., and W. J. Merrell, Jr.
Journal of Physical Oceanography, Vol. 5, No. 3, p 549-551, July 1975. 2 fig, 1 tab, 2 ref.

Descriptors: *Ocean circulation, *Drift bottles, *Gulf of Mexico, Currents(Water), Ocean currents, Movement, Water circulation, Oceans, Oceanography.
Identifiers: *Caribbean Sea, American Mediterranean.

Between October 25 and December 11, 1973, 1015 surface drifters were launched at 36 stations in the American Mediterranean. Returns from 75 drifters (7.4%) have been received from 23 (64%) of the 36 stations. No flow into the Caribbean Sea through the Mona and Windward Passages was indicated. A net westward drift in the Caribbean Sea of 0.18 m/s was indicated. Movement in the Gulf of Mexico was consistent with observations and models of the Loop Current. (Sims - ISWS)
W76-00907

(COUNCIL ON EDUCATION IN THE GEOLOGICAL SCIENCES) PROGRAMS PUBLICATIONS, NO 18, ESTUARINE OCEANOGRAPHY,
F. F. Wright.
Mc-Graw Hill, New York, NY, 1974, 76 p, Illus, Maps.

Descriptors: *Estuarine environment, Oceanography, Limnology, Education.

Techniques for studying estuarine oceanography are outlined in this publication which is designed as a laboratory supplement for undergraduate courses in oceanography or limnology. The estuarine environment is discussed, e.g., geomorphology, geology, biology and oceanography. The techniques to be employed are then described. These methods include: study-site selection; working boats; bathymetric survey; tides and tidal observations; wave determination and analysis; current measure; water sampling and analysis and tracer and diffusion studies. Mixing and flushing in estuaries is also considered. An exercise on a model estuary, Hypothetical Bay, is included with study plans. Appendices provide additional information on the use of commercial equipment for classroom studies, current drogue specifications, bathymetric survey dats sheets, current measurement sheets, drift-can data and inshore T-S 9temperature-salinity) probe survey sheets. Numerous graphs and illustrations supplement the test.--Copyright 1974, Biological Abstracts, Inc.
W76 00994

SPHAEROMA TEREBRANS: A THREAT TO THE MANGROVES OF SOUTHWESTERN FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76 00998

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

EVALUATION OF NEW REVERSE OSMOSIS MEMBRANES FOR THE SEPARATION OF TOXIC COMPOUNDS FROM WASTEWATER, SECOND ANNUAL SUMMARY REPORT,
Illinois Univ. at Urbana-Champaign. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-00512

DESALTERS SOW SEEDS FOR SAUDI INDUSTRY.
Chemical Week, Vol 117, No 7, p 57-58, August 13, 1975

Descriptors: *Desalination, *Treatment facilities, Design, Powerplants, Sea water, Electrical engineering, Waste water treatment, Water treatment.
Identifiers: *Saudi Arabia.

Three dual-purpose desalination and electric generating plants have been planned for Saudi Arabia. A 50 mgd, 500-mw plant in Jedda on the Red Sea is being designed by a British firm, while two plants in the Eastern province, a 30 mgd, 300-mw plant at Al-Jobail and a 5 mgd, 50-mw plant at Al-Khafji, are being designed by a United States corporation. A conventional desalination method of multistage flash evaporation will be employed. While this technique requires a large amount of steam to make fresh water, the hydrocarbons necessary for producing steam are plentiful in Saudi Arabia and the need for water is crucial. By integrating the desalting plants with the production of electrical power, the fresh water production costs will be only 12 cents per cu m. The actual engineering, designing, and construction of the three plants will cost $15 billion and contracts will be divided into packages for bidding. Among these packages are: a power plant, including the steam boiler, site preparation, intake and outfall for the plant; living quarters for workers building the plant; and outside facilities such as power transmission. Additionally, Saudi Arabia has provided $3.5 million to organize a research center to study seawater desalination and related problems such as corrosion. (Kramer-FIRL)
W76-00636

THE EFFECT OF FINITE CHANNEL WIDTH ON CONCENTRATION POLARISATION REVERSE OSMOSIS UNDER LAMINAR FLOW CONDITIONS,
Birmingham Univ. (England). Dept. of Chemical Engineering.
J. W. Carter, and G. Hoyland.
Chemical Engineering Science, Vol 30, No 9, p 1190-1191, September, 1975. 4 fig, 1 tab, 9 ref.

Descriptors: *Membrane processes, *Reverse osmosis, Laboratory tests, Mathematical models, Separation techniques, Semipermeable membranes, Laminar flow, Membranes, Liquid wastes, Desalination processes, Waste water treatment.

In previously published theoretical treatments of reverse osmosis during laminar flow in channels of rectangular cross-section, the effect of the side walls on the local velocity gradient, and therefore on local concentration polarization, has been assumed to be negligible. The fact that this assumption does not hold true for narrow channels was theoretically investigated by considering the velocity distribution in the cross-section of a channel of finite width. Experimental investigations were conducted by making a membrane impermeable adjacent to the side walls. The effect o side walls on the velocity profile was theoret demonstrated to be largely confined to a widt jacent to them equal to the channel height sets of laminar flow reverse osmosis experi were conducted using sodium chloride solu Smooth clean semi permeable cellulose ac membranes were used in each case. The e mental and predicted concentration polarizat the membrane surface in each of the two s compartments was calculated. Masking is req for experimental results to conform with p tions based on an infinitely wide channel. FIRL)
W76-00642

ENERGY QUALITY INTERACTIONS OF LIGHT, WATER, FOSSIL FUEL, AND LAN
Florida Univ., Gainesville. Dept. of Environ tal Engineering Sciences.
For primary bibliographic entry see Field 3E.
W76-00754

ADVANCED PROCESSES: WATER DES ING AND REUSE,
Arizona Univ., Tucson. Dept. of Civil Engine and Engineering Mechanics.
For primary bibliographic entry see Field 5D.
W76-00756

ION EXCHANGE WATER TREATMENT,
For primary bibliographic entry see Field 5F.
W76-00850

3B. Water Yield Improvement

A GEOPHYSICAL METHOD FOR DE MINATION OF AQUIFER PARAMETERS HARD ROCKS,
Central Water and Power Research Station, P (India).
For primary bibliographic entry see Field 2F.
W76-00529

POTENTIAL OF MADISON GROUP AND SOCIATED ROCKS TO SUPPLY INDUST WATER NEEDS, POWDER RIVER BA WYOMING AND MONTANA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-00666

EVAPOTRANSPIRATION PHREATOPHYTES IN THE NORTH PLA BASIN OF WYOMING,
Wyoming Univ., Laramie. Water Reso Research Inst.
For primary bibliographic entry see Field 2D.
W76-00673

DEMONSTRATED TECHNOLOGY RESEARCH NEEDS FOR REUSE OF NICIPAL WASTEWATER,
SCS Engineers, Long Beach, Calif.
For primary bibliographic entry see Field 5D.
W76-00692

SOIL WETTABILITY AND FIRE IN ARIZ CHAPARRAL,
Rocky Mountain Forest and Range Exper Station, Fort Collins, Colo.
For primary bibliographic entry see Field 2G.
W76-00698

ARIZONA STATE WATER PLAN, PHASE VENTORY OF RESOURCE AND USES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W76-00700

Use Of Water Of Impaired ality

ITY POLICY FOR COLORADO RIVER
do State Univ., Fort Collins. Dept. of tural Engineering.
mary bibliographic entry see Field 5G.
553

TS OF FREQUENCY OF SPRINKLING SALINE WATERS COMPARED WITH DRIP IRRIGATION,
tural Research Service, Riverside Calif. Lab.
stein, and L. E. Francois.
my Journal, Vol 67, No 2, p 185-190, April, 1975. 2 fig, 6 tab, 13 ref.

tors: *Sprinkler irrigation, *Crop produc- Plant physiology, *Irrigation water, Sprin- aline water, Salts, Sodium chloride, Calci- ride, Salt torerance, Foliar, Leaves, Irriga- ects, Plant growth, Crop production, Ap- n methods.
ers: *Drip irrigation, Plant injury, Foliar, orption, *Bell peppers.

ppers (Capsicum frutescens) were sprin- ery 2.3, 3.5, and 4.75 days with low salt (450 rs) and medium and high salt waters (1,000 00 mg/liter of added NaC1 + CaC12). Addi- plots were drip irrigated with the same Sprinkling with the low- salt water and drip n with all 3 waters caused no leaf damage. sprinkled every 2.3 days with the 2 high salt suffered more leaf burn and produced yields than plants sprinkled less often. ng with the high-salt water reduced yields an 50% at all sprinkling frequencies. Injury ld loss appear to be related primarily to lt absorption. (Robinett-Arizona)
708

NSE TO THREE SEMIDWARF MEX- WHEATS TO DIFFERENT AERATION TIONS IN THE ROOTING MEDIUM AT STANT SALINITY LEVEL,
Nacional de Agricultura Chapingo
).
N. Everardo, L. H. Stolzy, and G. R.
ence Society of America Proceedings, Vol , p 515-518, May-June 1975, 2 fig, 2 tab, 13

tors: *Soil gasses, *Aeration, *Oxygen nents, *Root zone, *Plant growth, Agriculture, Soil environment, Environ- control, Soil physical properties, Soil pro- Soil chemistry, *Soil-water-plant relation- oil physics, Dissolved oxygen, Oxygena- one of aeration, Plant growth, Crop e, Plant physiology, Salinity, Root ment, Mexico, Transpiration.
ers: *Mexican wheat, Nuri 70, Inia 66, rros 66.

sponse of 3 newly developed Mexican Triticum aestivum L.) varieties, Nuri 70, and Siete Cerros 66, to low oxygen at con- inity of -4 bars in the rooting medium was a water culture experiment under growth conditions. Oxygen concentrations in were maintained at 1.5, 5.2, and 7.6 ppm. eties were affected by low oxygen at high but Inia 66 had the greatest adaptability. concentrations of 1.5 ppm decreased plant ter production by 50% and reduced trans- by 54-65%. Root porosities increased with crease in oxygen content, with Inia 66 the largest increase. A 5.2 ppm oxygen ration in solution was found to be optimum yield, water use, and leaf and root dry matter production if Inia wheat was grown without salinity stress in the root zone. (Robinett-Arizona)
W76-00710

WATER REPELLENT SOIL MULCH FOR REDUCING FERTILIZER NUTRIENT LEACHING: II. VARIABLES GOVERNING THE EFFECTIVENESS OF A SILICONATE SPRAY,
Agricultural Research and Education Center, Belle Glade, Fla.
G. H. Snyder, H. Y. Ozaki, and N. C. Hayslip.
Soil Science Society of America Proceedings, Vol 38, No 4, p 678-681, July-August, 1974. 4 tab, 7 ref.

Descriptors: *Mulching, *Nitrogen, *Potassium, *Leaching, *Nutrients, *Sweet corn, Crop production, Crop response.

Nitrogen and potassium leaching from a fertilizer band in sand soils was reduced by creating a mulch of water repellent soil over the band using a siliconate spray. Best results were obtained using a 1% siliconate spray in quantities sufficient to penetrate about 3 cm over a region 20 cm wide, on the flat surface of raised vegetable beds. Mulches created on peaked beds were ineffective in reducing leaching, probably due to erosion of the mulch. Sweet corn yields are comparable to those obtained by protecting N and K with plastic mulch or by applying N and K in split applications. (Skogerboe-Colorado State)
W76-00719

DIFFERING SENSITIVITY OF CORN AND SOYBEAN PHOTOSYNTHESIS AND TRANSPIRATION TO LEAD CONTAMINATION,
Illinois Univ., at Urbana-Champaign.
For primary bibliographic entry see Field 5B.
W76-00720

NITROGEN-15 VARIATIONS IN FERTILIZER NITROGEN,
Kernforschungsanlage, Juelich (West Germany). Institut fuer Physikalische Chemie.
For primary bibliographic entry see Field 5A.
W76-00722

THE CONTROL OF NITRATE ACCUMULATION IN SOILS BY INDUCED DENITRIFICATION,
Technion-Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 5B.
W76-00732

EFFECT OF SALTS AND SALTS PLUS NITROGEN-15-LABELED AMMONIUM CHLORIDE ON MINERALIZATION OF SOIL NITROGEN, NITRIFICATION, AND IMMOBILIZATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
R. L. Westerman, and T. C. Tucker.
Soil Science Society of America Proceedings, Vol 38, No 4, p 602-605, July-August, 1974. 1 fig, 5 tab, 11 ref.

Descriptors: *Nitrogen, *Nitrification, Salinity, *Salts, *Ammonium compound, Water pollution sources.
Identifiers: *Mineralization, Immobilization.

The effects of 0.0, 0.01, 0.1 and 1.0M concentrations of sodium, copper and calcium chloride salts added to Pima clay loam with and without (15) NH4C1 on mineralization of soil nitrogen, nitrification, and immobilization were measured over a 49-day period. Dilute concentrations of salt, (15) NH4C1, and dilute salts plus (15) NH4C1 stimulated mineralization of soil N. The 'priming effect' was shown to be real and not just a simple exchange. Nitrification of native ammonium nitrogen and (15) N-labeled ammonium decreased with increasing concentrations of salt. High concentrations of copper and calcium chloride salts inhibited nitrification of (15) N-labeled ammonium more than sodium salts. Immobilization of (15) NH4 (+) -N was decreased significantly by high concentrations of salt. Gaseous loss processes were decreased with increased salts. (Skogerboe-Colorado State)
W76-00735

INTERACTIVE EFFECTS OF SALINITY AND FERTILITY ON YIELDS OF GRAINS AND VEGETABLES,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
L. Bernstein, L. E. Francois, and R. A. Clark.
Agronomy Journal, Vol 66, No 3, p 412-421, May-June, 1974.

Descriptors: *Salt tolerance, Salinity, *Crop response, *Fertilization, Saline soils, Corn(Field), Wheat, Barley, Vegetable crops, Phosphates, Crop production.

The salt tolerance of crops has usually been studied under optimal fertility conditions. The objectives of the present studies were to compare crop response to salinity when nutrients were limiting, adequate, or in excess to guide proper fertilization of saline soils and to determine whether additional fertilizer could restore yield losses caused by salinity. Corn, wheat, barley, and six vegetable crops were grown to maturity in large, outdoor sand cultures to study the interactive effects of salinity and nutrition. Increasing levels of phosphate (0.1 to 2.0 mM) aggravated salt injury in corn and decreased salt tolerance. Decreasing solution K from 2 to 0.4 meq/liter did not affect leaf K or yield of corn. Deficient levels of P or N did not consistently decrease salt tolerance of any of the crops studied, although the wheat and barley varieties showed erratic decreases in salt tolerance when N or P were deficient. When N or P was severely growth-limiting, salinity affected growth of some crops. Conversely, when salinity severely limited growth, nutritional responses of some crops decreased. (Skogerboe-Colorado State)
W76-00741

POTENTIAL FOR AGRICULTURE UTILIZING WASTE HEAT FROM POWER PLANTS,
Arizona Univ., Tucson. Environmental Research Lab.
N. G. Hicks.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 231-240.

Descriptors: *Water requirements, *Water utilization, *Thermal pollution, *Environmental engineering, *Greenhouses, Arizona, Water supply, Economics, Water resources, Arid lands, Water conservation, *Energy, Heat, Temperature, Plant growth, Heated water, Heating, Power plants, Horticulture, Soil temperature, Agriculture, Profit, Nutrients, Industrial plants.
Identifiers: Soil warming.

The quality of heat (temperature level) is more appropriate to the biological processes of plant and animal grwoth than it is to almost any kind of industrial or process application. Research effort has been centered on soil warming, mariculture or aquaculture, and greenhouse vegetation production. Open field agriculture crops consume from 1.5 to 6 acre feet per year of water, and yield from 100 to, at most, 400 dollars per acre in gross revenue. Controlled-environment agriculture consumes about 7 acre feet of irrigation and cooling water per year, with a gross revenue of from 60,000 to 180,000 dollars per year, and with a 95% recovery of applied nutrients by the plants. The amount of heat rejected from a southern Arizona copper smelter is more than adequate to handle the types of greenhouse facilities being conceived today, and the energy level of the heat from these

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smelters has a thermodynamic availability such that conventional heating methods can be employed within the greenhouse. (See also W76-00745) (Robinett-Arizona)
W76-00757

CITY WASTE WATER REUSE FOR NUCLEAR POWER PLANT COOLING,
Arizona Public Service Corp., Phoenix.
For primary bibliographic entry see Field 5D.
W76-00760

ACCRETION AND DILUTION OF NUTRIENTS IN YOUNG CORN, AS AFFECTED BY YIELD RESPONSE TO NITROGEN, PHOSPHORUS, AND POTASSIUM,
National Fertilizer Development Center, Muscle, Ala.
G. L. Terman, and S. E. Allen.
Soil Science Society of America Proceedings, Vol 38, No 3, p 455-460, May-June 1974. 5 fig, 1 tab, 13 ref.

Descriptors: Fertilizers, Nutrient removal, Nutrients, *Nitrogen, *Phosphorus, *Potassium, *Corn(Field), *Crop response.

Hybrid corn was grown in infertile soil fertilized with none and three nonzero rates of N, P, or K in separate treatment series; other nutrients were applied in each series at uniform levels. Near-linear increases in uptake of N, P, or K with amount applied occurred during 25, 41, and 53 days' growth. Concentrations of N, P, or K increased with amount applied and decreased with continued growth in each series; uniformly applied P and K, N and K, or N and P were diluted with increase in dry matter resulting from continued growth and yield response to increasing amounts of the third nutrient. Yield-concentration relationships in the N response series were similar for N, Ca, Mg, Mn, and Zn. Response to P or K resulted in dilution of all other nutrients. Concentrations of total cations increased with concentrations of N in each response series; the reverse was true with P and K. Thus, the results suggest that a positive relationship between dry matter yields and total cations (C), total inorganic anions (A), and C-A depends on whether yield reponse is due to N or to other growth-limiting factors. (Skogerboe-Colorado State)
W76-00823

SOIL PHOSPHORUS AVAILABILITY AS MEASURED BY DISPLACED SOIL SOLUTIONS, CALCIUM-CHLORIDE EXTRACTS, DILUTE-ACID EXTRACTS, AND LABILE PHOSPHORUS,
Colorado State Univ., Fort Collins. Dept. of Agronomy; and Colorado State Univ., Fort Collins. Dept. of Soil Sciences.
P. N. Soltanpour, F. Adams, and A. C. Bennett.
Soil Science Society of America Proceedings, Vol 38, No 2, p 225-228, March-April, 1974. 4 fig, 17 ref.

Descriptors: *Fertilizers, Fertility, *Soil tests, Sorghum, Crop response, *Phosphorus, Water quality, Water pollution sources, Measurement.

Five rates of Ca(OH)2 and four rates of Ca(H2PO4)2-H2O were added in all combinations to samples of a P-deficient, low pH, sandy loam soil. The treated soil was subjected to several wetting-drying-pulverizing cycles to facilitate equilibration. Soil solutions were subsequently displaced from sub-samples and analyzed; other subsamples were extracted for P and CaCl2 and dilute acid; 'labile P' was determined on subsamples from each treatment; a sorghum-sudangrass hybrid was grown in the greenhouse to measure P availability. Maximum yield of test plants was obtained at about 22 micro-m of P in the displaced soil solution, 12 micro-m of P in the CaCl2 extract, 80 ppm P on soil-weight basis in dilute-acid extract, and 50 ppm of 'labile P' on soil-weight basis. The P uptake was highly correlated with the logarithm of P concentration in soil solution and CaCl2 extract, logarithm of 'labile P' and concentration of P in dilute acid extract. All indexes were nearly equal as indicators of P availability. (Skogerboe-Colorado State)
W76-00825

A TWO-PHASE MODEL FOR THE MISCIBLE DISPLACEMENT OF REACTIVE SOLUTES IN SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
J. Skopp, and A. W. Warrick
Soil Science Society of America Proceedings, Vol 38, No 4, p 545-550, July-August, 1974. 5 fig, 1 tab, 32 ref. EPA Contract 68-03-0208

Descriptors: *Model studies, Solutes, Adsorption, Diffusion, Connection, Soils, Calcium, Magnesium, Water quality.
Identifiers: *Miscible displacement, Solute transfer, Picloram.

Miscible displacement is studied by considering the flow regime to be composed of separate mobile and stationary phases. Solute transfer through the mobile phase occurs only by convection, whereas adsorption or reaction by the soil matrix is diffusion limited and occurs normal to the mobile-stationary interface. The model is unique in that a specific rate law is not assumed, but the solution is exact. Results are presented graphically as a function of two parameters which are compared with experimental results of other workers. The displacement of calcium by magnesium was more closely in agreement with theoretical predictions than was absorption of picloram. (Skogerboe-Colorado State)
W76-00826

EFFECT OF TRANSPIRATION RATE ON SALT ACCUMULATION AROUND CORN ROOTS IN A SALINE SOIL,
Punjab Agricultural Univ., Ludhiana, India. Coll. of Agricultural Engineering.
B. K. Sinha, and N. T. Singh.
Agronomy Journal, Vol 66, No 4, p 557-560, July-August, 1974. 1 fig, 3 tab, 11 ref.

Descriptors: *Saline soils, Salinity, Ions, *Transpiration, Salts, *Corn(Field), *Root zone.
Identifiers: Ion accumulation, Closely adhering soil, Loosely adhering soil.

Laboratory studies were conducted to determine the extent of ion accumulation around corn roots of plants exposed to different transpiration conditions. Ion accumulation in the apparent free space of roots, the soil adhering to the roots, and the bulk soil was studied using a soil mixed with sodium chloride so that the electrical conductivity of saturation extract was 3.96 mmho/cm. Maximum ion accumulation occurred in the apparent free space of the roots, followed by the closely adhering soil. Under high transpiration, sodium concentration increased from 37.6 mg/100 g in the bulk soil to 90.3 mg/100 g in the soil close to the roots. After the same treatment, a threefold increase in the chloride content of the closely adhering soil was observed. A significant correlation existed between the rate of water loss per unit root length and the Na and Cl concentration of the closely adhering soil. Results indicate that under high transpiration, the salt concentration close to the roots may be much higher than that obtained from an analysis of the bulk soil. (Skogerboe-Colorado State)
W76-00827

MINIMIZING THE SALT BURDENS OF IRRIGATION DRAINAGE WATERS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. D. Rhoades, J. D. Oster, R. D. Ingvalson, J. M. Tucker and M. Clark
Journal of Environmental Quality, Vol 3, No 4, p 311-316, October-December, 1974. 7 tab, 7 ref.

Descriptors: *Salinity, *Saline water, *Drainage, *Drainage water, Lysimeter, Return flow, Water quality, Water pollution, Alfalfa, *Saline soils, Irrigation, Irrigation practices.

The salt burdens of percolated drainage waters resulting from the use of water, synthesized to represent eight important river waters of the western USA, for irrigation of alfalfa in a controlled lysimeter experiment, are presented. These data show that minimizing the quantity of drainage water resulted in the smallest possible return of applied salts in the return flow because (1) it maximizes the precipitation of carbonate minerals and gypsum in the soil, (2) it minimizes soil mineral weathering and the dissolution of salts previously deposited in the soil, and (3) it maximizes the amount of soluble salt diverted in the water that is retained in storage in the soil profile and not returned in the drainage water. (Skogerboe-Colorado State)
W76-00828

ASSESSING SOIL SALINITY AND IDENTIFYING POTENTIAL SALINE-SEEP AREAS WITH FIELD SOIL RESISTANCE MEASUREMENTS,
Agricultural Research Service, Sidney, Mont.
A. D. Halvorson, and J. D. Rhoades.
Soil Science Society of America Proceedings, Vol 38, No 4, p 576-581, July-August 1974. 7 fig, 4 tab, 12 ref.

Descriptors: *Salinity, *Soil tests, Soil properties, Electrical conductance, Measurement, Instrumentation, Great Plains, *Saline soils.
Identifiers: Soil conductivity.

The recent widespread increase in the occurrence of seep areas high in salinity in the northern Great Plains has increased the need for soil salinity research. The objective of the study was to examine the use of soil conductivity values calculated from resistance measurements obtained with the four-probe-Wenner electrode configuration to identify potential saline-seep areas and estimate soil salinity in the field. Plots of apparent soil conductivity (EC) vs inner-electrode spacing (a) yielded different types of curves for saline-seep areas, recharge areas, and intermediate areas. Plots of EC vs a or EC values alone can be used to identify potential saline-seep areas. Significant correlations were obtained in May (r=0.98) and August (r=0.96) between apparent soil conductivity and electrical conductivity of saturation extracts showing that four-probe soil resistance measurements can also be used to estimate soil salinity in the field. (Skogerboe-Colorado State)
W76-00835

ASSESSING A MARSH ENVIRONMENT FOR WASTEWATER RENOVATION,
Agricultural Research Center, Fort Lauderdale, Fla.
For primary bibliographic entry see Field 5D.
W76-00892

3D. Conservation In Domestic and Municipal Use

CLIMATE OF MINNESOTA, PART VIII. PRECIPITATION PATTERNS IN THE MINNEAPOLIS-ST. PAUL METROPOLITAN AREA AND SURROUNDING COUNTIES,
Minnesota Dept. of Natural Resources, St. Paul. Div. of Water, Soils and Minerals.
For primary bibliographic entry see Field 2B.
W76-00504

'ALUATION OF WATER REUSE FOR 'IPAL SUPPLY,
rn Illinois Univ., Carbondale.
nary bibliographic entry see Field 5D.
514

CEPTOR SEWERS AND SUBURBAN 'L: THE IMPACT OF CONSTRUCTION 'S ON RESIDENTIAL LAND USE. ME I, ANALYSIS.
Systems Research and Engineering, Inc., dge, Mass.
nary bibliographic entry see Field 5D.
515

AL SIZING OF URBAN FLOOD-CON-SYSTEMS,
ogic Engineering Center, Davis, Calif.
g Analysis Branch.
nary bibliographic entry see Field 4A.
554

ATING INDIRECT COST OF URBAN R USE,
and Koebig, Inc., Los Angeles, Calif.
awrence.
of the Environmental Engineering Divi-oceedings of ASCE, Vol 101, No EE4, p , August, 1975. 3 fig, 4 tab, 21 ref, append.

tors: *Water utilization, *Water demand, costs, *Indirect costs, Water supply, Ci-aphical methods, Dissolved solids, Hard-ater), *Municipal water, Estimating, Water Dissolved solids, Californai.

ers: Total dissolved solids, Total hardness, ia Water Quality Control Plan, Los An-alif).

lified composite graphical representation estimation of indirect costs of urban water resented. The graphs were developed from ure search of past investigations of quality-cost effects. The estimation technique was uring the preparation of the California Quality Control Plan for the Los Angeles anning Area Basin 4B, a large urban area ltiple sources of local and imported water Estimating curves are presented to assist etermination of the economic impact upon onsumers of mineral quality of water as by the parameter total dissolved solids A total impact cost curve for urban con- both industrial and nonindustrial, was ed for a range of TDS between 200 mg/liter mg/liter and a range of total hardness (TH) 100 mg/liter and 40 mg/liter assumed to be ly one-half of the value of TDS. The slope otal impact cost curve is the penalty cost, expressed in dollars/acre-foot per 100 TDS. The major components of the total cost curve are domestic plumbing, water heaters, municipal waterworks nt, industrial water treatment, and all and commercial measures performed to TH. Ways are presented to modify the pact cost curve to reflect local conditions hey may be significantly different from ssumed for the curves presented. The nust be considered as guides, not as ab-alues, and should be used in relation to the nditions. (Orr-FIRL)
30

NSHIP'S NEED OF FILTERED WATER,
n and Steel Co., Ltd, Jamshedpur (India).
ngineering Dept.
osh.
of the Institution of Engineers (India), Vol PH 2, p 40-42, February, 1975. 5 tab, 3 ref.

ors: *Water demand, *Water supply, utilization, Water users, Water require-Domestic water, Industrial water.

In order to determine the future water requirements of the twonship of Jamshedpur, India, the consumption of water was divided into different consuming divisions: domestic; public and municipal; commercial; industrial; and, miscellaneous and wastage. Tables are presented which illustrate the total daily consumption, both past and present, for each of these categories. The figures have been used to project future consumption figures, on the basis of expected development of each of these five categories. The township may require an average supply of 138 million liters/day of filtered water in 1986, with an expected increase over the following ten years to 157 million liters/day. The consumption rate for the population may reach 452 lped by 1986, and 476 by about 1996. Domestic consumption equalled about 75% of the total consumption in 1951, 60% of the total in 1971, and will most likely equal 53% of the total in 1996. In the future more filtered water will be used for industrial, commercial, public and municipal activities and less will be used for domestic purposes. The present growth rate of the curve for miscellaneous use and wastage must be restricted to limit the potential wastage of filtered water. (Orr-FIRL)
W76-00641

PILOT PLANT OPTIMIZATION OF PHOSPHORIC ACID RECOVERY PROCESS,
Lancy Labs., Inc., Zelienople, Pa.
For primary bibliographic entry see Field 5D.
W76-00676

SPECIFICATIONS FOR MATERIALS RECOVERED FROM MUNICIPAL REFUSE,
National Center for Resource Recovery, Inc., Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-00684

RAINFALL-RUNOFF RELATIONS ON URBAN AND RURAL AREAS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-00685

CHARACTERIZATION AND UTILIZATION OF MUNICIPAL AND UTILITY SLUDGES AND ASHES. VOLUME II - MUNICIPAL SLUDGES,
Dayton Univ. Ohio. Research Inst.
For primary bibliographic entry see Field 5E.
W76-00688

CHARACTERIZATION AND UTILIZATION OF MUNICIPAL AND UTILITY SLUDGES AND ASHES. VOLUME IV - MUNICIPAL INCINERATOR RESIDUES,
Dayton Univ. Ohio. Research Inst.
For primary bibliographic entry see Field 5E.
W76-00690

CHOICE BETWEEN SURFACE AND GROUNDWATER FOR WATER SUPPLIES TO URBAN CENTRES,
Societe d'Etudes pour le Traitement et Utilisation des Eaux, Paris (France).
For primary bibliographic entry see Field 4B.
W76-00814

3E. Conservation In Industry

A TOWNSHIP'S NEED OF FILTERED WATER,
Tata Iron and Steel Co., Ltd, Jamshedpur (India). Town Engineering Dept.
For primary bibliographic entry see Field 3D.
W76-00641

THE REVOLUTION IN WATER MANAGEMENT,
For primary bibliographic entry see Field 5G.
W76-00648

POTENTIAL OF MADISON GROUP AND ASSOCIATED ROCKS TO SUPPLY INDUSTRIAL WATER NEEDS, POWDER RIVER BASIN, WYOMING AND MONTANA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-00666

CHARACTERIZATION AND UTILIZATION OF MUNICIPAL AND UTILITY SLUDGES AND ASHES, VOLUME III - UTILITY COAL ASH,
Dayton Univ. Ohio. Research Inst.
For primary bibliographic entry see Field 5E.
W76-00689

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTE WATER TREATMENT IN CHLOR-ALKALI PRODUCTION,
Houston Univ., Tex. Dept. of Quantitative Management Science.
For primary bibliographic entry see Field 5D.
W76-00707

PROCEEDINGS, CONFERENCE ON WATER REQUIREMENTS FOR LOWER COLORADO RIVER BASIN ENERGY NEEDS.
Arizona State Fuel and Energy Office (Phoenix).
For primary bibliographic entry see Field 6D.
W76-00745

OVERVIEW OF WATER REQUIREMENTS FOR ELECTRIC POWER GENERATION, (FOR THE LOWER COLORADO RIVER BASIN),
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 6D.
W76-00746

WATER USE AS A FACTOR IN MEETING ELECTRIC POWER NEEDS,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 6D.
W76-00747

WATER AND ENERGY REQUIREMENTS FOR AN OIL SHALE INDUSTRY,
Atlantic Richfield Corp., Los Angeles, Calif.
For primary bibliographic entry see Field 6D.
W76-00749

A PRELIMINARY ANALYSIS OF THE ENERGY AND WATER REQUIREMENTS FOR DEVELOPING GEOTHERMAL ENERGY IN ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 6D.
W76-00750

WATER AND ENERGY REQUIRED TO OPERATE COAL GASIFICATION FACILITIES AND WASTE WATER TREATMENT REQUIREMENTS,
El Paso Natural Gas Co., Tex.
For primary bibliographic entry see Field 6D.
W76-00751

WATER AND ENERGY REQUIREMENTS TO MINE, PROCESS, AND REPROCESS NUCLEAR FUELS,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 6D.
W76-00752

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WATER AND ENERGY REQUIREMENTS IN THE MINING AND PROCESSING OF COAL, INCLUDING LAND RECLAMATION,
Peabody Coal Co., St. Louis, Mo.
For primary bibliographic entry see Field 6D.
W76-00753

ENERGY QUALITY INTERACTIONS OF SUNLIGHT, WATER, FOSSIL FUEL, AND LAND,
Florida Univ., Gainesville, Dept. of Environmental Engineering Sciences.
H. T. Odum.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 165-194. 16 fig, 1 tab, 4 ref.

Descriptors: *Energy, *Energy conversion, *Solar radiation, *Water utilization, Energy transfer, Energy loss, Energy dissipation, Fossil fuels, Water properties, Economics, Efficiencies, Water resources, Arid lands, Arizona, Water shortage, *Desalination, Heated water, Vegetation effects, Electric power production.
Identifiers: Energy flows, Amplifier actions, *Solar energy.

To maximize power, energy flows generate energy of higher quality and a chain of energy quality transformations develops with total calories of energy decreasing at each step but with increasing quality and concentration of that transformed. High quality energy, such as fossil fuel, realizes its value only when it is used to amplify another energy flow of lower quality with as much stimulation of new energy flow as was used in its formation. The energy qualities of a Calorie of sunlight, fossil fuel, and water estimated from the energy used in transformations are summarized. Energy relationships of desalination, solar energy conversion to electricity, solar energy use by productivity compared with solar technology, solar water heaters, and dispersed solar heat are discussed along with choices in use of energy and water in arid regions. (See also W76-00745) (Robinett-Arizona)
W76-00754

ENVIRONMENTAL ASPECTS OF SOLAR ENERGY APPLICATIONS,
Arizona Univ., Tucson. Opitical Sciences Center.
A. B. Meinel, and M. P. Meinel.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 196-205.

Descriptors: *Energy, *Energy conversion, *Solar radiation, *Water utilization, *Powerplants, Efficiencies, Arizona, Water resources, Arid lands, Heated water, Electric power production, Heat transfer, Agriculture, Planning, Water conservation, Heating, Cooling.
Identifiers: *Solar energy, Solar power farms, Solar energy conversion.

The future of solar energy is described. Arizona could grow enough alfalfa to operate its power plants at a reasonable cost, but it would take most of the total flow of the Colorado River to support the irrigation load. Conversion of solar energy into heat and then using this heat for constructive purposes such as heating water for domestic and commercial applications appears to be a possible option. House heating and cooling is technologically a simple task in comparison with generating electrical power. The subject of large solar farms which would collect energy for whole communities is discussed along with the possibility of an extensive farm of solar collectors as the heat rejection system of conventional power plants. Assuming a conversion efficiency of 25%, it would require 10,000 square miles of solar farms to generate enough energy to meet the current national need. (See also W76-00745) (Robinett-Arizona)
W76-00755

WATER CONSUMPTION AND POWER PLANT HEAT REJECTION,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
R. Fazzolare.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 241-257. 6 fig, 2 tab, 3 ref.

Descriptors: *Water requirements, *Water supply, *Water demand, *Electric power industry, *Water conservation, *Nuclear power plants, Water management(Applied), Economics, Water utilization, Water resources, Arid lands, Water sources, *Arizona, Electric power production, Planning, Energy, Cooling water, Recirculated water, Heat transfer, Ventilation, Costs, Efficiencies, Water cooling, Nuclear reactors, Cooling towers, Heated water, Fossil fuels.

Water requirements and consumption in thermal electric power plants in which fossil fuels and uranium are used as the primary energy source are discussed. 50% of the heat rejection from power plants in the U.S. is of the once-through type and the other 50% is accomplished by means of cooling towers in which air passes over sprayed water and induces the evaporative cooling. For a large community, it is estimated that the waste waters produced are about 4 times the cooling requirement of a nuclear power plant that could generate the electrical needs of the community. Average cooling water evaporation for fossil fuel power generation in Arizona of a 1000 megawatt plant was 11,700 acre-feet per year and for nuclear plants from 15,000 to 19,000 acre-feet per year. Comparisons of dry and wet cooling schemes show capital costs of dry cooling systems to be 4 times that of wet towers. (See also W76-00745) (Robinett-Arizona)
W76-00758

THERMAL POWER PLANT SITING IN AN ARID REGION-ENVIRONMENTAL CONSTRAINTS,
Bechtal Power Corp., Los Angeles, Calif.
H. Ponrehn.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 258-303. 3 fig, 3 ref.

Descriptors: *Water conservation, *Water requirements, *Water supply, *Thermal powerplants, *Arid lands, *Environmental effects, Electric power industry, Economics, Water utilization, Water resources, Electric power production, Sites, Planning, Energy, Water consumption(Except Consumptive use), Locating, Ecology, Environmental engineering, Air pollution, Public health, Safety, Design criteria, Evaluation, Geology, Topography, Meteorological data, Esthetics.
Identifiers: Environmental constraints, Powerplant site selection.

There are a number of concerns in the arid region siting of thermal power plants; primary concern is the consumption of water. Additional concerns are esthetics and environmental constraints imposed on the site selection by public pressures, from regulatory agencies at all levels of government, from the engineering features of the project, and from economic pressures and scheduling constraints. Careful consideration of plant, transmission line, and access route layout and design can minimize impacts on highly sensitive and slowly recovering ecosystems which characterize arid regions. The geological and seismological characteristics of a region are of highest priority in assessing its acceptability for siting a nuclear plant, whereas fossil plant site selection, due to the concern for air quality impacts, is influenced strongly by the meteorological and topographic features of an area. Coal fired power plant site selection is severely constrained by the location of the fuel source and the economics of fuel transportation. (See also W76-00745) (Robinett-Arizona)
W76-00759

ENVIRONMENTAL COSTS FOR THE GENERATING STATION,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Fiel
W76-00761

3F. Conservation In Agricul

SOIL CRUSTS.
Arizona Agricultural Experiment Statio
For primary bibliographic entry see Fiel
W76-00517

THE EFFECT OF SOIL CRUSTS ON I TION: THE EFFECT OF AGGREG AND DEPTH OF TILLAGE ON STEA TRATION THROUGH CRUST-TOPPE SOILS,
Minnesota Univ. St. Paul.
For primary bibliographic entry see Fiel
W76-00539

EFFECT OF DAILY IRRIGATION O CONTENT AND SUCTION PROFILES OF THREE TEXTURES,
Agricultural Research Service. Pross Western Region.
For primary bibliographic entry see Fiel
W76-00697

IRRIGATION METHOD AS A DETE OF LARGE PORE PERSISTENCE AN STRENGTH OF CULTIVATED SOILS
Colorado State Univ., Fort Collins. Agricultural Engineering.
For primary bibliographic entry see Fiel
W76-00699

THE INFLUENCE OF LOCAL ADVEC EVAPO-TRANSPIRATION FROM IR RICE IN A SEMI-ARID REGION,
Commonwealth Scientific and Industria Organization, Griffith (Australia). Div tion Research.
For primary bibliographic entry see Fiel
W76-00713

EFFECTS OF TIME TAKEN TO APP RIGATION ON SEASONAL IR REQUIREMENTS,
Department of Agriculture, Ottawa Chemistry and Biology Research Inst.
W. K. Sly, and J. C. Wilcox.
Canadian Agricultural Engineering, Vo p 82-85, December 1974. 3 tab, 11 ref.

Descriptors: *Scheduling, *Irrigation Consumptive use, *Irrigation system *Canada, Soil water, Water consumptio

Daily climatic data for the 30 year peri were used in two routine scheduling pro estimate seasonal irrigation requiremen of different water-holding capaciti selected localities in British Columbia procedure, described in detail by Wilco (Can. Dept. Agric. Tech. Bull. 83, 1974) lows the practices recommended for the Valley. Four days are required to appl centimeters of water to the field. In procedure, equipment was assumed that water would be applied to the ent the same time. The same basic princip lowed as with the first procedure, but a were made to ensure that the same ava soil water to plants prevailed under bot Differences in the irrigation requiremen from these adjustments. In every cas each water-holding capacity of the soi climatic condition, less water was requ the second scheduling method. (S Colorado State)

00731

VALUE OF VEGETATION FOR CONSER-
ION I. FOUR LAND AREAS IN BRITAIN,
re Conservancy, Grange-over-Sands
and). Merlewood Research Station.
rimary bibliographic entry see Field 2I.
00736

VALUE OF VEGETATION FOR CONSER-
ION II. M1 MOTORWAY AREA,
re Conservancy, Grange-over-Sands
and). Merlewood Research Station.
rimary bibliographic entry see Field 2I.
00737

NGES IN ARTIFICIAL DRAINAGE, FER-
SERS, AND CLIMATE IN SCOTLAND,
rd Univ. (England). Dept. of Agricultural
ce.
W. Green.
al of the Environmental Management, Vol 2,
p 107-121, April 1974. 10 fig, 2 tab, 6 ref.

riptors: *Environmental effects, *Drainage
ts, Drainage systems, Fertilization,
ilizers, Climatic data, *Climates.
ifiers: *Scotland.

nt research has drawn attention to certain
onmental changes, some natural and some
made, which have been taking place concur-
in recent years, and which are affecting
water in streams, and the water level in the
Because the available data, on either side of
Border, were not strictly comparable, the
r paper had to be restricted to England and
s. The present paper deals with Scotland in a
ally similar manner. The environmental
es considered are field drainage, use of fer-
s, and climatic changes. (Skogerboe-
ado State)
00742

ICULTURAL WASTE MANAGEMENT,
ican Society of Civil Engineers, New York.
onmental Engineering Div.
rimary bibliographic entry see Field 5G.
00744

UNDWATER SEMINAR, GRANADA.
and Agriculture Organization of the United
ns, Rome (Italy).
rimary bibliographic entry see Field 4B.
00807

E FACTORS INFLUENCING GROUND-
ER DEVELOPMENT AND USE FOR
ICULTURE,
and Agricultural Organization, Rome (Italy).
and Water Development Div.
rimary bibliographic entry see Field 4B.
00813

RETION AND DILUTION OF NUTRIENTS
OUNG CORN, AS AFFECTED BY YIELD
ONSE TO NITROGEN, PHOSPHORUS,
POTASSIUM,
nal Fertilizer Development Center, Muscle,

rimary bibliographic entry see Field 3C.
00823

ER RELATIONS OF COTTON. I. ROOT
WTH AND WATER USE AS RELATED TO
GROWTH AND SOIL WATER CONTENT,
ultural Research Service, Auburn, Ala.
Taylor, and B. Klepper.
omy Journal, Vol 66, No 4, p 584-588, July-
st, 1974. 5 fig, 11 ref.

Descriptors: *Root development, *Root systems, Crop response, Moisture tension, *Moisture availability, Soil-water-plant relationships, *Cotton, Soil water.

Many experiments have evaluated the effects of decreasing soil water contents on top growth and yield of plants, but few experiments simultaneously have evaluated root growth. An experiment was conducted to determine the response of cotton roots and tops to decreasing soil water content. Plants were grown in rhizotron compartments with rainfall excluded by metal covers over the soil. Soil profile or irrigation schedule treatments provided different levels of soil and plant water potentials. Soil water content was determined with a neutron probe; rooting density, from measurements of roots on the glass viewing surface of each compartment. Plant water potential was determined with a pressure chamber apparatus, and top growth was evaluated by plant height. For conditions of this experiment, cotton root growth was correlated with decreases both in plant water potential and in soil water content. (Skogerboe-Colorado State)
W76-00824

MIXING IN SPRINKLER IRRIGATION SYSTEMS,
CH2M/Hill, Redding, Calif.
G. J. Hermann, G. M. McMaster, and D. W. Fitzsimmons.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 6, p 1020-1024, 1028, November-December, 1974. 6 fig, 9 ref.

Descriptors: *Sprinkler irrigation, *Irrigation practices, Irrigation, *Mixing, Irrigation water, Fertilization, Fertilizers, *Idaho, Flow.
Identifiers: Branching flow mixing.

A study was conducted at Aberdeen, Idaho, to determine the amount of mixing between two fluids traveling in a branching flow lateral under the field conditions found in a sprinkler irrigation system. The objective was to develop methods to predict the effects of state of flow, of couplers and of branching flow on mixing and dilution of chemical injected into operating sprinkler irrigation laterals. The resulting basic understanding of branching flow mixing could be used to manage chemical applications through sprinkler systems for best placement and effectiveness. Using irrigation systems to apply chemicals will reduce the usage of conventional application equipment and result in labor and energy savings as well as a reduction of soil compaction and crop damage. (Skogerboe-Colorado State)
W76-00834

EFFECT OF IRRIGATION AND WATER-TABLE DEPTH ON CROP YIELDS,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
R. F. Follett, E. J. Doering, G. A. Reichman, and L. C. Benz.
Agronomy Journal, Vol 66, No 2, p 304-308, March-April 1974. 3 fig, 1 tab, 15 ref.

Descriptors: *Water management, *Drainage, *Corn(Field), *Sugarbeets, *Alfalfa, Irrigation effects, Irrigation practices, Drainage practices, *Crop production.

The objective in this field study was to determine the most desirable combination of amount of irrigation and degree of drainage for production of corn, sugarbeets, and alfalfa grown on sandy soil over a declining water table. Irrigation was applied at weekly intervals at rates of either 0, 0.5, 1.0, or 1.5 times the water requirement of the crops as predicted by the modified Jensen-Haise equation. Irrigation amounts were applied in combination with shallow, medium, and deep drainage. In 1971 and 1972, early season depth to water table was 92 and 69 cm for the shallow drainage treatment, 166 and 145 cm for the medium, and 186 and 193 cm for the deep. Water-table declines were 94 and 96 cm during the 1971 and 1972 growing seasons, respectively, under all treatments. Corn was harvested at maturity, sugarbeets in mid-October, and alfalfa (three cuttings) at 1/10 bloom. Maximum yields of all crops occurred over the shallow water table; no yield response to irrigation was observed over the shallow water table. (Skogerboe-Colorado State)
W76-00837

PIPE SIZE SELECTION FOR COMMUNITY IRRIGATION SYSTEMS,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 6, p 1029-1032, 1037, November-December, 1974. 3 fig, 3 tab, 13 ref.

Descriptors: *Irrigation design, Irrigation engineering, Irrigation, *Pipelines, *Pipes, Piping systems, Economics, Community development, *Irrigation systems.

An analytical result and procedures to select optimal pipe sizes for the water delivery pipe network of community irrigation systems were developed. The application of the method to the Shamrock Irrigation Project showed that the result is an acceptable approximation of the result obtained by linear programming. The time required to use the method for selecting pipe sizes is less than the time needed to prepare computer cards for the linear programming. (Skogerboe-Colorado State)
W76-00839

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN, MACRO MODEL SIMULATION.
Washington Univ., Seattle, Dept. of Civil Engineering.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 192, $4.75 in paper copy, $2.25 in microfiche. State of Washington Water Research Center, Pullman, Report No 17A, November 1974. 93 p, 11 fig, 7 tab, 7 ref, 2 append. Edited by B. W. Mar and W. R. Butcher. OWRT B-036-WASH (9), B-043-WASH (8), and B-050-WASH (8). 14-31-0001-3348, -3663, -3944.

Descriptors: *Washington, *Model studies, *Systems analysis, *Simulation analysis, Planning, Computer models, River basin development.
Identifiers: *Yakima River Basin(Wash), MACRO models.

Simple simulation (MACRO) models that contain a few parameters and that provide a gross representation of a river basin in space and time have the advantages of rapid construction and a transparent development process. These attributes are valuable when synthesizing and examining major linkages between more detailed models of various sectors of a river basin. The construction, theory, and application of MACRO models to integrate and evaluate the system analysis of the Yakima River Basin in presented and their utility demonstrated. (Bechard-Washington)
W76-00503

LIBRARY U. OF I. URBANA-CHAMPAIGN

STUDIES ON OPERATIONS PLANNING AND CONTROL OF WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W76-00506

INTERCEPTOR SEWERS AND SUBURBAN SPRAWL: THE IMPACT OF CONSTRUCTION GRANTS ON RESIDENTIAL LAND USE. VOLUME I, ANALYSIS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W76-00515

HYDROLOGY FOR ENGINEERS AND PLANNERS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-00531

BIBLIOGRAPHY OF HYDROLOGY, CANADA, 1971-1973.
International Association of Hydrological Sciences, Ottawa (Ontario).
For primary bibliographic entry see Field 10C.
W76-00532

OPTIMAL SIZING OF URBAN FLOOD-CONTROL SYSTEMS,
Hydrologic Engineering Center, Davis, Calif. Planning Analysis Branch.
D. W. Davis.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY8, Paper 11490, p 1077-1092, August 1975. 5 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Computer models, *Simulation analysis, *Systems analysis, *Flood control, *Optimization, Urban hydrology, Hydrology, Hydraulics, Flood protection, Mathematical models, Cost analysis, Planning.
Identifiers: Economic feasibility.

Optimal sizes for components of urban flood-control systems can be determined from a detailed simulation analysis controlled by an optimization methodology. Flood-control measures within urban areas frequently consist of complex systems of detention storage reservoirs, channel modifications, levees, land-use controls, flood proofing, and pumping facilities. The optimal size of each of these system components depends on the system interaction with other components and the hydrologic, economic, environmental, and other performance outputs of the system. A technique has been developed and programmed for an existing model that automatically determines the sizes of urban flood-control components of detention storage, flow diversions, and pumping plants to maximize system net benefits. The system was simulated using hydrologic data, component cost and performance functions, and flow damage information at damage centers. (Terstriep-ISWS)
W76-00554

LARGE RURAL AREA ORGANIZES FOR POTABLE WATER,
For primary bibliographic entry see Field 5F.
W76-00618

THE FLOATING COVER: BEST WAY TO COVER A FINISHED-WATER RESERVOIR.
For primary bibliographic entry see Field 5F.
W76-00624

CONTROL OF WATER QUALITY IN TRANSMISSION AND DISTRIBUTION SYSTEMS,
Roanoke County Public Service Authority, Salem, Va.
For primary bibliographic entry see Field 5F.
W76-00633

A FOURTH DIMENSION--RECREATION AND AMENITY,
For primary bibliographic entry see Field 6B.
W76-00644

THE SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 4. ST. LAWRENCE RIVER BASIN--VOLUME 1. BASINS OF STREAMS TRIBUTARY TO LAKES SUPERIOR, MICHIGAN, AND HURON,.
Geological Survey, Reston Va.
For primary bibliographic entry see Field 7C.
W76-00651

EVALUATION OF EFFECTS OF LAND-USE CHANGES ON STREAMFLOW,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W76-00657

FLOOD-HAZARD STUDY--100-YEAR FLOOD STAGE FOR APPLE VALLEY DRY LAKE, SAN BERNARDINO COUNTY, CALIFORNAI,
Geological Survey, Menlo Park, Calif.
M. W. Busby.
Available from the National Technical Information Service, Springfield Va. 22161. Water-Resources Investigations 11-75, June 1975. 40 p, 16 fig, 7 tab, 10 ref, 2 append.

Descriptors: *Flood plain zoning, *Flood frequency, *Deserts, *Californai, Playas, Land use, Construction, Flood protection, Flood forecasting, Peak discharge, Hydologic data, Synthetic hydrology.
Identifiers: *San Bernardino County(Calif), *Apple Vallye(Calif).

The 100-year flood stage for Apple Valley dry lake in Sa. Bernardino County, Calif., was developed by synthetic hydrologic techniques because adequate hydrologic or meteorologic data were not available for the basin. The 100-year flood stage was estimated to be at an elevation of 2,909.0 feet (886.7 metres) above mean sea level. Accelerated land developments during the past 10 years in the deserts of southern California may cause problems related to urban zoning. Much of the development consists of second or vacation-type homes, but also includes many expensive permanent residences. Desert playas or dry lakes often seem to be desirable development areas because of their flat topography and consequent abundance of good building sites. Although normally dry, playas commonly contain water after large storms, and homes built in and near the bottom of the playas can be subject to flooding. Because of this flooding potential, San Bernardino County is establishing flood-zoned areas on many playas. The boundary of the flood zone is defined by the 100-year water level--the water level that is exceeded, on the average, once in a 100-year period. (Woodard-USGS)
W76-00659

A HYDROLOGIC ASSESSMENT OF THE SEPTEMBER 14, 1974, FLOOD IN ELDORADO CANYON, NEVADA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-00663

HYDROLOGY OF THE LAKE WINGRA BASIN, DANE COUNTY, WISCONSIN.
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 2H.
W76-00667

MAP SHOWING FLOOD-PRONE A COLORADO SPRINGS-CASTLE ROCK FRONT RANGE URBAN CORR COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C
W76-00668

MAP SHOWING AVAILABILITY HYDROLOGIC DATA PUBLISHED AS O BY THE U.S. ENVIRONMENTAL DATA VICE AND BY THE U.S. GEOLOGICAL VEY AND COOPERATING AGE COLORADO SPRINGS-CASTLE ROCK FRONT RANGE URBAN CORR COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C
W76-00669

A LAND USE DECISION METHODOLOG ENVIRONMENTAL CONTROL,
Rocky Mountain Center on Environment, D Colo.
For primary bibliographic entry see Field 6E
W76-00683

ARIZONA STATE WATER PLAN, PHASE VENTORY OF RESOURCE AND USES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E
W76-00700

INFLUENCE OF SOIL-WATER POTENTI THE WATER RELATIONSHIPS OF E MESQUITE,
Texas State Technical Institute, Amarillo.
For primary bibliographic entry see Field 2I
W76-00703

WATER POTENTIALS OF SALSOLA K AT DIFFERING LEVELS OF SUBST WATER AVAILABILITY,
Forest Service (USDA), Odgen, Utah. Inte tain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2I
W76-00705

TCA IN IRRIGATION WATER AFTER TREATMENTS FOR WEED CONTROL,
Agricultural Research Service, Prosser, W rigated Agriculture Research and Ex Center.
For primary bibliographic entry see Field 5E
W76-00706

REHABILITATION OF LAND DISTURB SURFACE MINING COAL IN ARIZONA,
Arizona Univ. Tucson. Dept. of Wa Management.
For primary bibliographic entry see Field 5C
W76-00709

EXECUTIVE SUMMARY OF CRI WATER PROBLEMS FACING THE E WESTERN STATES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6E
W76-00716

WESTWIDE STUDY REPORT ON CRI WATER PROBLEMS FACING THE E WESTERN STATES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6E
W76-00717

T NUTRIENT LOSSES FROM TILE-OUT-
ERRACES,
State Univ., Ames. Dept. of Agronomy.
imary bibliographic entry see Field 5B.
0723

LATION OF GAMMA-DISTRIBUTED
-ORDER MARKOV CHAIN,
tment of the Environment, Ottawa
io). Hydrology Research Div.
imary bibliographic entry see Field 2E.
0743

ONAL FORMULA NEEDS CHANGE AND
ORMITY IN PRACTICAL APPLICATION,
Pagan.
and Sewage Works, Vol 119, No 10, p 92-
tober, 1972. 5 fig.

iptors: *Hydrographs, *Flow rates, Storage,
r storage, Mathematical studies,
ograph analysis.

ications of mathematical procedure for the
al formula are suggested to get a more accu-
epresentation of design peak flow rate and
hydrograph representation. The modified
lure utilizes the basic concept that the rising
f most flood hydrographs is steeper than the
ng limb, implying that water goes into
e faster than it is removed from storage.
oski-FIRL)
0775

IESTER'S STORMWATER DRAINAGE,
hreys (Howard) and Sons, London
nd).
imary bibliographic entry see Field 5D.
0791

TREATMENT OF RAIN WATER. RAIN
FLOW, RAIN OVERFLOW BASINS,
PURIFICATION TANKS, RAIN
HMENT BASINS (DIE BEHANDLUNG DE
NWASSERS),
imary bibliographic entry see Field 5D.
0801

LINEAR HYDROLOGICAL MODELS FOR
WATER DRAINAGE (NIGHT-LINEARE
OLOGISCHE MODELLE IN DER STAD-
AESSERUNG),
eniger.
nd Wasserfach, Wasser/Abwasser, Vol 113,
p 430-435, September, 1972. 13 fig, 30 ref.

ptors: *Sewerage, *Runoff forecasting,
ematical models, Surface runoff, Urban
ogy, Parametric hydrology, Model studies.
iers: Germany.

-linear mathematical model of the urban sur-
unoff for the calculation of non-stationary
in sewer systems is presented. The calcula-
are based on general, simultaneous dif-
al equations for the surface runoff, i.e. the
uity and the energy equations. The latter can
uced to an equation for the resistance for
ary, uniform runoff which means that the
e runoff for a given interval can be regarded
sistationary and locally uniform. The com-
watershed is decomposed into surface ele-
with different successions of the runoff
caused by them. The specific runoff ob-
for the individual surface elements is then
osed to the corresponding surface elements.
put data of the mathematical model are
trical and hydrological parameters such as
g conditions, depth and distribution of sur-
epressions, surface roughness as well as
g and evaporation characteristics, propor-
and average length and slope of the in-
al surface element types. Results indicate that variations in rainfall intensity with time are of substantial influence on the magnitude of the runoff peak. (Sandoski-FIRL)
W76-00802

THE TOTAL RUNOFF COEFFICIENT IN MIXED SEWER SYSTEMS (DER GESAMTABFLUSSBEIWERT IN MISCHKANALISATIONEN),
K. Krauth.
Gas- und Wasserfach, Wasser/Abwasser, Vol 113, No 7, p 329-331, July, 1972. 7 fig, 2 tab, 3 ref.

Descriptors: *Storm runoff, *Runoff coefficient, Rainfall-runoff relationships, Sewerage, Soil water, Runoff forecasting.
Identifiers: Germany.

Results from measurements of the total runoff coefficient in the Stuttgart-Buesnau sewerage treatment facility indicates that the average quantity of storm water which fails to run off was found to be 0.52 mm (0.85 mm in dry weather and 0.46 mm in moist soil). This quantity of results almost exclusively from losses due to soil wetting and in the form of puddle water. After the total runoff coefficient is reduced accordingly with respect to this loss, it becomes a constant value of about 1. Therefore it is surmized that the average storm runoff for an individual rainfall can be calculated from the quantity of the precipitation, less the losses due to wetting and puddle water. (Sandoski-FIRL)
W76-00803

ON APPLYING THE PRINCIPLE OF MAXIMUM ENTROPY TO HYDROLOGICAL PROBLEMS AND RUNOFF FORECASTING (O PRIMENENII PRINTSIPA MAKSIMUMA ENTROPPI V ZADACHAKH GIRDOLOGII I PROGNOZIROVANIYA STOKA),
I. V. Busalayev, and S. K. Davletgaliyev.
Meteorologiya i Gidrologiya, No 4, p 61-68, 1972. 2 fig, 1 tab, 10 ref.

Descriptors: *Runoff forecasting, Distribution patterns, Hydrologic data.
Identifiers: Entropy, Experimental data.

A method for evaluating the probabilities of runoff magnitudes by applying the principle of maximum entropy is suggested. The selection of the most adequate distribution is possible by means of this principle which exploits experimental data available as much as possible without introducing any redundancy. In this study the principle is applied to two different problems: (1) the determination of the distribution with available data on the first three moments; and (2) the selection of the most adequate distribution with a multitude of curves for one and the same accidental magnitude. It is concluded that the principle of maximum entropy should be applied whenever a multitude of distributions are available without experimental data being sufficient or existent. (Sandoski-FIRL)
W76-00804

CHARACTERISTICS AND COUNTERMEASURES AGAINST URBAN RIVER FLOODS (TOSHI KASEN NO SUIGAI NO TOKUSEI TO TAISAKU),
H. Takahide.
Kankyo Joho Kagaku, Vol 1, No 1, p 33-37, May, 1972. 1 fig, 5 tab.

Descriptors: *Flood control, *Rivers, Cities, Rural areas, Flood damage, Population, Drainage, Sewerage, Storm runoff.
Identifiers: Japan.

A projected picture of flood control facilities and river conditions in urban areas for 1972 shows that 11.4% of the entire urbanized area in Japan will be endangered by floods at every rain of more than 50 mm hour quantity. According to the investigations of the Ministry of Construction, the percentages of flooded houses in urban and rural areas between 1961 and 1967 show a clear pattern. Except for 1962 when the number of total flooded houses was distributed evenly between the urban and rural areas, the majority of flood damage was found in the cities, the most prominent case being 80% to 20% in 1963. Between 1960 and 1970, the total space of congested city area in Japan increased by 65% with an increase in population of 15 million. This statistic translates to 53.5% of the total population of Japan living in an urban environment. As of 1971, the ratio of reinforced rivers in urban areas averaged 17%, and only 25% of the total urban area has flooded prevention measures. An estimated $48.8 million will be needed between 1974 and 1980 in order to remodel all the rivers, drainage, and sewage systems in Japan to accomodate storm runoff. (Sandoski-FIRL)
W76-00805

CHOICE BETWEEN SURFACE AND GROUNDWATER FOR WATER SUPPLIES TO URBAN CENTRES,
Societe d'Etudes pour le Traitement et Utilisation des Eaux, Paris (France).
For primary bibliographic entry see Field 4B
W76-00814

MINIMIZING THE SALT BURDENS OF IRRIGATION DRAINAGE WATERS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.
W76-00828

A LABORATORY TEST OF SOME DRAIN TUBE FILTER MATERIALS,
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 8G.
W76-00832

EVALUATION OF SURFACE WATER RESOURCES FROM MACHINE-PROCESSING OF ERTS MULTISPECTRAL DATA,
Indiana State Univ., Terre Haute. Dept. of Geography and Geology.
For primary bibliographic entry see Field 5G.
W76-00833

MIXING IN SPRINKLER IRRIGATION SYSTEMS,
CH2M/Hill, Redding, Calif.
For primary bibliographic entry see Field 3F.
W76-00834

WATER RESOURCES OF WASHINGTON, A BIENNIAL REPORT TO THE LEGISLATURE, JANUARY 1975.
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 6B.
W76-00880+

DILUTION AND DECAY OF AQUATIC HERBICIDES IN FLOWING CHANNELS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W76-00895

THE 1973 FLOOD AND MAN'S CONSTRICTION OF THE MISSISSIPPI RIVER,
Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
C. B. Belt, Jr.
Science, Vol. 189, No. 4204, p 681-684, August 29, 1975. 6 fig, 15 ref.

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Descriptors: *Flood flow, *Flood stages, *Mississippi River, Floods, Flood discharge, Flood peak, Navigable rivers, Levees, Stream erosion, Streambeds, Hydrology, Sediments, Geomorphology, Sediment transport, River beds, Rivers, Rating curves.
Identifiers: *Man's interference, *Stream constriction, Man-made modifications, Time trends, Maximum yearly stages, Minimum yearly stages.

The 1973 flood broke the stage (river level) records between Burlington, Iowa, and Cape Girardeau, Missouri, a distance of 562 km. At St. Louis, Missouri, the flood, which began March 10, continued for 77 consecutive days, exceeding the record set in 1844 when the river was in flood for 58 days during the entire year. The river crested at St. Louis on April 28, 1973 at a gage height of 13.18 m (4.03 m above flood stage) and a peak discharge of 24,100 cu m/sec. The stage topped the 189-year record by 0.3 m. The flood peak was 0.61 m higher in 1973 than in 1844 but the discharge was about 33% less than the estimated flow for 1844. The 1908 flood had the same flow as the 1973 flood but the peak was 2.51 m lower. The hydrographic data was analyzed to find out the reasons for record-breaking stages. The study concludes that the progressive constriction of the Mississippi for navigation since 1837 has caused bottom erosion in some stretches. In others, the bottom oscillates up and down with time. The high stages rise much more rapidly. Constriction of the river channel causes flooding and makes floods higher, thus navigation works degrade the protection afforded by levees. The combination of navigation works and levees causes significant rises in the stages of floods. Additional channel constriction and levee building will cause further problems. The 1973 flood's record was man-made. (Lee - ISWS)
W76-00901

MATHEMATICAL SIMULATION OF GROUND-WATER ABSTRACTION FROM CONFINED AQUIFERS FOR RIVER REGULATION,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W76-00904

JET DISCHARGE INTO A STRATIFIED RESERVOIR,
San Jose State Univ., Calif. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W76-00911

PERMITS FOR ACTIVITIES IN NAVIGABLE WATERS OR OCEAN WATERS.
For primary bibliographic entry see Field 8A.
W76-00945

PIERCE V. RILEY (ACTION BY RIPARIAN OWNERS FOR INJUNCTION TO PROVIDE ACCESS TO LAKE).
219 N. W. 2d 434 (Mich 1974).

Descriptors: *Riparian rights, *Canal construction, *Judicial decisions, *Michigan, Land tenure, Land resources, Canals, Bodies of water, Lakes, Water demand, Water resources development, Water law, Water management(Applied), Civil engineering.
Identifiers: *Injunctive relief.

An action was brought by riparian owners for a declaration of rights and injunctive relief against owners of a lot on which a canal had been constructed to provide access to the lake for ninety nonriparian lots. The lower court granted plaintiff's injunction but refused plaintiff's request to order the canal filled. On appeal the Supreme Court reversed, and held that the cause should be held in abeyance pending findings of fact and a decision by the Department of Natural Resources on an application by defendents pursuant to the Inland Lakes and Streams Act of 1972. (Proctor-Florida)
W76-00976

OMERNIK V. STATE OF WISCONSIN (APPEAL FROM CONVICTION FOR DIVERSION OF WATERS FROM LAKES AND STREAMS WITHOUT A PERMIT).
218 N. W. 2d 734 (Wis 1974).

Descriptors: *Wisconsin, *Alteration of flow, *Relative rights, *Diversion, Judicial decisions, Routing, Prior appropriateion, Riparian rights, Water management(Applied), Water utilization, Navigable waters, Streams, Lakes, Bodies of water, Water resources development, Water law, Legislation, Constitutional law.
Identifiers: Liability(Legal aspects).

By a judgment of the county court, the defendant was convicted of violations of a statute prohibiting the diversion of waters from lakes and streams without a permit. The Circuit Court affirmed. On appeal the Supreme Court of Wisconsin held that the statute applied to both navigable and non-navigable streams. The permit requirement set forth by the legislature was not limited to stream-to-stream diversion. The court further held that the statue did not deny the appellant equal protection of the law with respect to the categories of water use coverage and did not constitute the taking of property without just compensation. (Proctor-Florida)
W76-00977

BOONE V. TILLATOBA CREEK DRAINAGE DISTRICT (SUIT SEEKING INJUNCTIVE RELIEF WITH RESPECT TO PROPOSED DRAINAGE PROJECT).
For primary bibliographic entry see Field 6E.
W76-00981

4B. Groundwater Management

STUDIES ON OPERATIONS PLANNING AND CONTROL OF WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W76-00506

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART V, OTHER TYPES OF WELLS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00525

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS. PART IX, LANDFILLS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00526

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS, PART X, SEWER LEAKAGE.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00527

GROUNDWATER POLLUTION FROM SUBSURFACE EXCAVATIONS, PART XI, TANK AND PIPELINE LEAKAGE.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00528

WATER RESOURCES OF HANCOCK CO WITH EMPHASIS ON GROUND-W AVAILABILITY,
Indiana Dept of Natural Resources, Indian Div of Water
For primary bibliographic entry see Field 7C
W76-00534

THE ASSESSMENT OF REGIONAL GRO WATER SCHEMES BY RIVER-FLOW RE SION EQUATIONS,
Department of the Environment, R (England). Central Water Planning Unit.
C. E. Wright.
Journal of Hydrology, Vol 26, No 3/4, p 20 August 1975. 4 fig, 4 ref.

Descriptors: *Regional analysis, *Regressio ysis, *River flow, *Groundwater, *Pu Wells, Regulated flow, Flow measurement, tions, Flow rates, Gaging stations, Data tions, Recession curves, Aquifer characte Withdrawal, Overdraft, Base flow.
Identifiers: *England, *Pumping schemes, of estimate, Skewness.

Artificial changes in river flow, such as caused by groundwater abstraction, can sessed by means of flow regression equatio vided that adequate flow records exist a straction rates are sufficiently high. Experi in a number of group pumping tests has ind that the ratio of groundwater abstraction standard error of estimate of the equation u estimate artificial flow changes is critical to liability of the test results. This ratio should be considered in the design stage of tests to the meaningful results are obtained. (Vi ISWS)
W76-00548

GROUND-WATER RECHARGE SIMULAT
New South Wales Univ., Kensington (Aus Faculty of Military Studies.
For primary bibliographic entry see Field 2F
W76-00555

HYDROSALINE REGIME OF SOME SOI THE MIDDLE PART OF THE CALM RIVER BASIN. (IN RUMANIAN),
Institutul de Studii si Cercetari Ped Bucharest (Rumania).
For primary bibliographic entry see Field 2G
W76-00573

GROUND-WATER LEVELS IN THE UN STATES, 1969-73: SOUTH-EASTERN STA
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C
W76-00652

GROUND-WATER BASIC DATA FOR G AND SIOUX COUNTIES, NORTH DAKOT
Geological Survey, Bismarck, N. DAK.
For primary bibliographic entry see Field 7C
W76-00653

ARTIFICIAL RECHARGE IN THE U SANTA ANA RIVER AREA, SAN BERNAR COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
D. H. Schaefer, and J. W. Warner.
Available from NTIS, Springfield, Va 2216 245-589 as price $3.75 printed copy; microfiche. Water-Resources Investigations July 1975. 27 p, 8 fig, 1 tab, 8 ref.

scriptors: *Artificial recharge, *Water spread- *Imported water, *Hydrogeology, lifornia, Aquifer characteristics, Groundwater vement, Infiltration rates, Forecasting, Water urces development, Water supply, Test wells, lling, Lithologic logs, Water yield, Water level tuations, Ground- water barriers, Ground- er potential, Faults(Geologic).
ntifiers: *San Bernardino County(Calif).

San Bernardino Valley, California Municipal ter District began receiving its initial entitle- nt of 46,000 acre-feet per year of imported thern California water in December 1972. By 0, the district will be receiving 102,000 acre- per year. Plans are to distribute this imported er for artificial recharge to the local ground- er system. The upper Santa Ana River area is l suited for artificial recharge because it is lar- underlain by permeable river-channel osits. Analyses of groundwater movement dur- current water-spreading operations, test- ling data, and application of Baumann's (1965) ation for calculating the theoretical size of the arge mound indicate that (1) barriers to undwater movement are not evident in the r-channel deposits, (2) depth to the basement plex is less in the area of the eastern spreading ins than in the western basins, (3) the spreading unds would be capable of accepting a combined l of as much as 80,000 acre-feet per year, and he water being recharged should move through part of the aquifer composed of river-channel osits toward the areas of pumpage. (Woodard-GS)
6-00655

OUND-WATER QUALITY BENEATH LID-WASTE DISPOSAL SITES AT CHORAGE, ALASKA,
logical Survey, Anchorage, Alaska.
primary bibliographic entry see Field 5B.
6-00656

OUND-WATER QUALITY IN INDIAN LLS VALLEY, CALIFORNIA,
logical Survey, Menlo Park, Calif.
primary bibliographic entry see Field 5A.
6-00658

E GROUND-WATER SITUATION IN THE CCLEVILLE AREA, PICKAWAY COUNTY, UTH-CENTRAL OHIO,
logical Survey, Columbus, Ohio.
. Norris.
o Department of Natural Resources, Colum- Report of Investigations No 96, 1975. 14 p, 6 l tab, 5 ref.

criptors: *Groundwater resources, *Well data, uifer characteristics, *Ohio, Hydrologic data, er yield, Pumping, Withdrawal, Water utiliza- , Groundwater movement, Groundwater arge, Water levels.
ntifiers: Pickaway County(Ohio).

he Circleville area in Pickaway County, south- tral Ohio, industrial wells yield 8 million gal- per day from sand and gravel outwash osits in the Scioto River valley. Groundwater ls in the pumped area have been declining e pumping began in the mid-1950's, from 40 to eet below land surface to 75 to 80 feet near the er of the cone of influence. Transmissivities at closely spaced pumping centers were deter- ed by analysis of the cone as 3,575 and 6,100 squared per day respectively. The hydraulic ductivity of the sand and gravel deposits is ut 60 feet per day. The wells are relatively far n the Scioto River, and most of the water drawn is from regional underflow, which is in- epted in transit to the stream. Yields of wells est to the river are sustained, in part, by in- ed infiltration. This component is expected to ease as the cone of influence grows in response to withdrawal by industry. For optimum use of the aquifer, future pumping could be spread over a larger area, and the new wells could be drilled outside the present cone of influence. Elsewhere in the Circleville area, sites are underlain by excellent aquifers, which are capable of yield much more water than is being withdrawn at the present time. (Woodard-USGS)
W76-00661

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES-UPPER COLORADO REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-00662

POTENTIAL OF MADISON GROUP AND ASSOCIATED ROCKS TO SUPPLY INDUSTRIAL WATER NEEDS, POWDER RIVER BASIN, WYOMING AND MONTANA,
Geological Survey, Denver, Colo.
F. A. Swenson.
In: Water Resources Problems Related to Mining: American Water Resources Association Proceedings Series No 18, p 210-218, June 1974. 5 fig, 4 ref.

Descriptors: *Groundwater resources, *Water quality, *Industrial water, *Wyoming, *Montana, Water resources development, Aquifer characteristics, Hydrologic data, Data collections, Water wells, Water yield, Chemical analysis, Water supply, Groundwater potential, Geology, Hydrogeology.
Identifiers: *Powder River Basin(Wyo-Mont).

A large part of the Nation's energy reserves are in the coal deposits of the Powder River Basin in Wyoming and Montana. One of the limiting factors of industrial development of these great energy reserves is the availability of water. Surface-water supplies that have not been appropriated for other uses within the basin are limited. A reconnaissance study began in July 1973 to assess the potential of the Madison Group and other deep carbonate aquifers to supply water needs for energy development of the Powder River strutural basin that lies between the Black Hills and the Bighorn-Pryor Mountains, extending from about Casper, Wyoming, to the Yellowstone River in Montana. Maps have been prepared of this area showing (1) thickness of Madison Group, plus additional carbonate aquifers underlying and in hydrologic continuity with Madison, (2) structure contours showing top of Madison Group, (3) potentiometric map showing the heights to which water will rise in tightly cased wells bottomed in the Madison and other carbonate aquifers, and (4) a map showing lines of equal dissolved-solids concentration in water from the carbonate aquifers. About 40 water wells, some yielding more than 9,000 gallons per minute, with maximum depths exceeding 10,000 feet have been completed. The good quality of the water (for example, 860 milligrams per litre dissolved solids in water from a depth of 8,000 feet and 80 miles from area of recharge) tends to indicate good circulation of water. It appears that signficant quantities of water can be made available from these deep aquifers for industrial development of the energy reserves of this area. (Woodard-USGS)
W76-00666

MAP SHOWING AVAILABILITY OF HYDROLOGIC DATA PUBLISHED AS OF 1974 BY THE U.S. ENVIRONMENTAL DATA SERVICE AND BY THE U.S. GEOLOGICAL SURVEY AND COOPERATING AGENCIES, COLORADO SPRINGS-CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-00669

SCREEN THEORY FOR WELLS AND SOIL DRAINPIPES,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 8B.
W76-00734

GROUNDWATER SEMINAR, GRANADA.
Food and Agriculture Organization of the United Nations, Rome (Italy).
FAO Irrigation and Drainage Paper No 18. Report of the FAO/UNDP Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, Spain, October 18-23, 1971. Published by FAO in 1973, 293 p.

Descriptors: *Groundwater, Groundwater movement, *Groundwater mining, *Optimum development plans, *Irrigation, *Water wells, *Water management(Applied), Hydraulics, Hydrology, *Water resources development, *Conjunctive use, Costs, Economics, Planning.

The working papers and the discussion which took place during the Seminar centered on four principal subjects: (1) Physical bases for the use of groundwater reservoirs; (2) Technical, economic, legal and institutional problems of groundwater utilization for agriculture and urban supply; (3) Examples of planning of hydrogeological investigations and of big scale projects of groundwater exploitation; (4) Systems analysis techniques for optimal utilization of hydraulic resources. (See also W76-00808 thru W76-00820)
W76-00807

THE ROLE OF GROUNDWATER IN SPAIN,
National Geology Commission, Madrid (Spain); and Guadalquivir Project, Madrid (Spain).
J. A. Gomez Angulo.
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 37-51, 7 tab.

Descriptors: *Groundwater mining, *Water resources development, *Arid lands, *Water budget, Groundwater, Groundwater basins, Agriculture, Irrigation, Reservoir storage, Wells, Hydrologic budget, Water resources, Water supply, Groundwater availability.
Identifiers: *Spain(Guadalquivir Project).

Spain hopes to increase groundwater's share of its total water budget from 20% to 50%. While the nation's total groundwater reserves are as yet unknown, those of the Guadalquivir and Segura Basins suggest that these reserves greatly exceed the storage capacity of surface reservoirs that now exist or that may be built in the future at competitive prices. Allowing for artificial recharge operation, groundwater, in close association with surface water and in superior conditions of competition with it, should constitute the basis of Spain's hydrological policy up to the year 2000. Thus, mining groundwater will become increasingly important and necessary for Spain. (See also W76-00807) (Bowden-Arizona)
W76-00808

GROUNDWATER RESERVOIRS: PHYSICAL BASES FOR THEIR USE,
Bureau de Recherches Geologiques et Minieres, Paris (France). Office of Geological and Mineral Research.
J. Margat.
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 52-66.

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Descriptors: *Groundwater, *Groundwater mining, *Aquifers, *Water management(Applied), *Aquifer characteristics, *Aquifer management, Overdraft, Recharge, Safe yield, Water resources development, Water budget, Boundaries(Surface), Geohydrologic units, Groundwater recharge, River basin development, Water resources, Water supply, River basins, Streams.

It is today conceivable and technically feasible to plan the tapping of an aquifer and to integrate its management in the broader framework of optimization of use of all water resources of a river basin or a territory. The study of an aquifer for the purpose of assessing its potentialities and uses that are justifiable by economic or financial calculations must be based essentially on research on the following physical data: the geometry of the reservoir; conditions at the confines, in particular its connection with streams and the sources of such streams; its lithology; hydrodynamic conditions; order of magnitude of the reserves; order of magnitude of the natural discharge and replenishment fluctuation pattern. (See also W76-00807) (Bowden-Arizona)
W76-00809

RECHARGING OF UNDERGROUND WATER DEPOSITS,
P. Ruby.
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 67-74.

Descriptors: *Recharge, *Water pollution, *Aquifer management, *Aritificial recharge, *Saline water intrustion, Groundwater, Safe yield, Overdraft, Water management(Applied), Aquifers, Injection wells, Groundwater recharge, Natural recharge, Infiltration, Storage coefficient, Hydrogeology, Aquifer characteristics, Groundwater basins, Hydrologic aspects, Hydrologic data, Water quality, Geohydrology.
Identifiers: Hydrogeologic survey.

Water is artificially recharged into grounwater deposits when human exploitation exceeds natural recharge, when the artificially recharged water is polluted and the soil acts as a filter, when the aquifer is used as storage for surplus surface water, and when salt water intrusions threaten fresh water aquifers. A review of costs for artificial recharging around the world shows that expenses vary a great deal. Generally, such recharge schemes are site specific and necessitate a thorough knowledge of local factors. However, one thing is needed in every case if one wishes to move away from the empiricism which has only too frequently governed the development of systems for the artificial recharging of water deposits: a good knowledge of these deposits, i.e. the carrying out of a serious hydrogeological survey of the reservoirs and a careful hydrological and physical/chemical survey of the fluid to be injected. (See also W76-00807) (Bowden-Arizona)
W76-00810

TECHNICAL, ECONOMIC AND ORGANISATIONAL ASPECTS OF THE EXPLOITATION OF GROUNDWATER RESOURCES,
Gaudalquivir Project, Madrid (Spain).
A. Bouton
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 75-90, 2 tab.

Descriptors: *Well drilling, *Rotary drilling, *Drilling equipment, *Water management(Applied), *Groundwater, Costs, Core drilling, Drilling, Casings, Drillers logs, Drilling fluids, Subsurface investigations, Clays, Aquifers.
Identifiers: Spain(Guadalquiver Project).

Although crude drilling techniques limited the exploitation of many aquifers in the past, modern methods and machinery have greatly expanded the number and kind of aquifers which can now be exploited. Cost of the water, based on the price of the drilling equipment, life of the well, and volume of water obtained are the major factors in determining whether drilling is viable. Costs and practices of drilling work of different nations are given. To insure that groundwater resources be protected, an official drilling authority, professional training, industrialization, and appropriate legislation area suggested. (See also W76-00807) (Robinett-Arizona)
W76-00811

GROUNDWATER RESOURCES: EVALUATION AND EXPLOITATION,
Arizona Univ., Tucson. Dept. of Geoscience.
J. W. Harshbarger.
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 91-118, 25 ref.

Descriptors: *Groundwater, *Groundwater mining, *Water management(Applied), *Sustained yield, *Aquifer management, Safe yield, Water resources development, Subsurface investigations, Overdraft, Recharge, Models, Computer models, Irrigation, Agriculture, Aquifer characteristics, Wells, Aquifers.

The concept of safe yield in the development and management of groundwater reservoirs has been supplanted by that of sustained yield, based on replenishment factors, aquifer mechanics techniques, and interception of discharge components. Data obtained from projects designed for aquifer appraisal can be examined with analytical and computer model simulation, its accuracy being dependent upon the reliability of the data used in the simulation of the water system. It is necessary not only to consider surface and groundwater sources together as a total resources, but to maintain data, assessment, and interpretation on a continuing basis. (See also W76-00807) (Paylore-Arizona)
W76-00812

SOME FACTORS INFLUENCING GROUNDWATER DEVELOPMENT AND USE FOR AGRICULTURE,
Food and Agricultural Organization, Rome (Italy). Land and Water Development Div.
C. E. Houston.
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 119-144, 16 ref.

Descriptors: *Water law, *Irrigation, *Groundwater mining, *Water management(Applied), Legislation, Groundwater, Groundwater basins, Water resources development.

Improved use of present water supplies and development of additional supplies for irrigation will be necessary to provide the increased food supplied needed in future decades. Groundwater is the most plentiful source of fresh water but all waters should be considered as one common resource. Insistence upon the total approach will require the expeditions use of a large number of essential complementary inputs. Groundwater development for agriculture has some decided advantages over surface water development. There is a need for national groundwater policies concerning investigations, utilization, and conservation, the maximum use of the resource. The also a need for new legislation for controlling vestigation, recovery and utilization of grou water. This, too, should be aimed at the beneficial and maximum use of the resou Finally, successful irrigation requires the sk combination of accumulated knowledge in n professional fields, including: engineering; w soil and plant sciences; economics; and othe cial sciences. Preparation of project proposals their appraisal, as well as project implement and management call for experienced judge based on a high degree of professional petence. A major argument for careful planni groundwater exploitation has been the experi and problems rampant in arid lands. (See W76-00807) (Bowden-Arizona)
W76-00813

CHOICE BETWEEN SURFACE AND GROU WATER FOR WATER SUPPLIES TO UR CENTRES,
Societe d'Etudes pour le Traitement et Utilis des Eaux, Paris (France).
C. Gomella.
In: Groundwater Seminar, Granada, Report o FAO/UNDP-Government of Spain Seminar o Role of Groundwater in the Optimal Utilizatio Hydraulic Resources, Granada, October 1 1971, Irrigation and Drainage Paper No 18. R 1973, p 145-165, 4 fig.

Descriptors: *Groundwater, *Urban hydrol *Surface waters, *Conjunctive use, *Econ justification, Water pollution, Surface-gro water relationships, Economic feasibility, veys, Hydrologic data, Water quality, Water t ment, Water resources, Water purification, ble water, Water sources, Water supply, W storage, Groundwater resources, Water ut tion.

Groundwater is generally water of high qu requiring no treatment. Surface supplies r from high quality water requiring convent processing such as coagulation, decantation, f tion, and careful sterilization, to water of quality whose processing and use are not practical. An economic survey was carried between high quality groundwater (requirin treatment) and high quality water which req minimum treatment. Groundwater was the economical for urban water supplies. (See W76-00807) (Robinett-Arizona)
W76-00814

THE ROLE OF GROUNDWATER IN THE TIMUM UTILIZATION OF WA RESOURCES,
Guadalquivir Project, Madrid (Spain).
F. Mortier.
In: Groundwater Seminar, Granada, Report o FAO/UNDP-Government of Spain Seminar o Role of Groundwater in the Optimal Utilizatio Hydraulic Resources, Granada, October 1 1971. Irrigation and Drainage Paper No 18. R 1973, p 166-185.

Descriptors: *Groundwater, *Surface wa *Conjunctive use, *Planning, Water man ment(Applied), Surface-groundwater rela ships, Water resources development, Aqui Optimization, Water utilization.

Optimum utilization of water resources is def as that which makes use of resources which limited and variable qualitatively and quantita ly in time and space, adequately and at least to the community. In a comparison of the cha teristics of surface and underground w stratification, water quality, flow, and exploit are described; while the role of groundwater i optimum utilization of water resources focuse the role of storage, regularization, and veyance, as well as the economic role of the ploitation of groundwater. In discussing the c

d use of surface and underground water urces, examples in California, the Indus in, and Mancha in Spain are presented. The ulate justifying the combined utilization of er resources is that the total of economically loitable resources can be increased, with the antages of this conjunctive use being a larger age capacity, profiting by the transport role ed by aquifers, possibility of development in es, and the knowledge that winter use of sur- water for power generation can be offset in mer when agricultural needs are met by winter ndwater recharge. Drawbacks include eralization, costs, technical difficulties, com- ated management. (See also W76-00807) ylore-Arizona)
5-00815

DELS FOR GROUNDWATER ANALYSIS,
rvard Univ., Cambridge, Mass.
B. Fiering.
Groundwater Seminar, Granada, Report of the O/UNDP-Government of Spain Seminar on the e of Groundwater in the Optimal Utilization of draulic Resources, Granada, October 18-23, 1. Irrigation and Drainage Paper No 19. Rome, 3, p 186-195.

scriptors: *Groundwater, *Model studies, nulation analysis, *Synthetic hydrology, athematical models, Planning, Computer dels, Hydraulic models, Optimization, Irriga- programs, Reservoir operation, Aquifer nagement, Continuity equation.

role of computers, mathematics, and of opera- s research, and relationships between proto- e problems and their mathematical counter- ts in groundwater analysis are discussed. eral cases in an irrigation program are used to sent solutions based on these model calcula- s, consisting of sets of decisions meeting con- ints and optimizing the objective functions. In e 1, the objective is to maximize the net efits, consisting of the agricultural benefit us the recreation loss minus the total costs, all ject to certain constraints, most of which cribe reservoir storage-release, aquifer rage-withdrawal, and the law of continuity. se 2 adds a budgetary constraint, where the ob- tive function is to maximize gross benefits, ulting in a solution differing from that obtained Case 1. Case 3 seeks to minimize the total cost demonstrate at the same time that optimiza- n is not necessarily maximization. A distinction nade between solution and decision, where the imal decision is the set of variables and the op- al solution is the value of the objective function ociated with these optimal decisions. A small nge in the decision can produce a large change solution, and vice versa. Clearly such ground- ter analyses are of the highest value in arid ds where water scarcity multiplies the worth of drologic resources. (See also W76-00807) ylore-Arizona)
6-00816

MULATION MODELS FOR CONJUNCTIVE E OF SURFACE AND GROUNDWATER,
rvard Univ., Cambridge, Mass.
B. Fiering.
Groundwater Seminar, Granada, Report of the O/UNDP-Goverment of Spain Seminar on the le of Groundwater in the Optimal Utilization of draulic Resources, Granada, October 18-23, 1, Irrigation and Drainage Paper No 18. Rome, 3, p 196-222, 17 fig, 1 tab.

scriptors: *Groundwater, *Conjunctive use, rface-groundwater relationships, *Model stu- s, *Synthetic hydrology, Asia, Computers, thematical models, Simulation analysis, onomics, Economic prediction, Aquifer charac- istics, Aquifer management, Water resources velopment.
ntifiers: *Pakistan, Indus River(Pakistan).

A simulation model for the plain of the Indus River in West Pakistan is used to describe the conjunctive use of surface and groundwater with an objective of maximization of agricultural productivity. The mathematical problem was to determine the proper setting for making the proper investment decisions. Seven basic assumptions wwere made in the simulation: (1) the surface and groundwater elevations are assumed to be horizontal in the area; (2) the depth to groundwater is everywhere uniform in the zone subtended by a single well; (3) the seasonal inputs of flow and precipitation are presumed to derive from bivariate log-normal distributions; (4) the feedback relationships can be represented by a deterministic component with a suitably distributed random additive component; (5) all depth-dependent flow vectors are initially approximated using the groundwater depth; (6) the ground surface and the bottom of the aquifer provide boundaries beyond which groundwater cannot migrate; and (7) all accretions and withdrawals from the groundwater occur uniformly over the entire area. (See also W76-00807) (Robinett-Arizona)
W76-00817

APPLICATION OF SYSTEMS ANALYSIS MODELS TO THE PROBLEM OF CONJUNCTIVE USE OF SURFACE AND GROUNDWATER IN THE VEGA OF GRANADA,
Instituto Geologico y Minero de Espana, Madrid.
D. Alvarez Fernandez, R. J. Delucia, M. B. Fiering, D. F. Luecke, and Q. T. Nguyen.
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 223-262, 9 fig, 1 tab.

Descriptors: *Groundwater, *Conjunctive use, *Surface waters, *Surface-groundwater relationships, *Model studies, *Systems analysis, Europe, Computers, Synthetic hydrology, Mathematical models, Simulation analysis, Aquifer management, Water resources development, Water management(Applied), Optimal development plans.
Identifiers: *Spain, Vega of Granada(Spain), High Genil Basin(Spain).

A combination of systems analysis techniques were utilized on problems of conjunctive use of surface and groundwater in the Vega of Granada, Spain. The study introduced the use of systems methodology to the planning efforts for this area and developed a set of models which demonstrated the usefulness of these techniques and should provide the basis for aiding in the definitive selection of the joint surface and groundwater development options. The techniques employed were those of storage yield analysis using synthetic hydrology and mathematical programming models to examine both capacity and operation questions. Initial programming solutions combined with the storage yield analysis indicate that the range of attractive alternatives appears to consist of significant development of the groundwater resources but only very limited extensions of the surface water capacity in certain sub-areas. The ability of systems analysis models to examine the many simulation tradeoffs that must be made in selecting the optimal development plan for such systems had been demonstrated in a growing number of water resources systems over the last decade. This study should be an initial step in the introduction of these techniques into the planning process in Spain. (See also W76-00807) (Bowden-Arizona)
W76-00818

COMPUTATION OF ECONOMIC DATA CONCERNING THE EXPLOITATION OF GROUNDWATER ON A REGIONAL SCALE,
Northern Sahara Water Resources Study Project, Alger (Algeria).
P. Pallas, V. Pietraru, and D. Huault.
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Government of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 263-285, 3 fig, 4 tab.

Descriptors: *Economics, *Groundwater, *Africa, *Model studies, *Water resources development, Mathematical models, Economic feasibility, Planning, Water management(Applied), Aquifer managment, Water yield, Wells, Costs, Water utilization, Groundwater resources, Synthetic hydrology, Water wells, Water supply.
Identifiers: Sahara, Sahara Desert.

In order to provide information on the investment and operating costs involved in the exploitation of groundwater on the scale of a region located in the Northern Sahara, a computational method was developed that makes it possible to transform data provided by hydraulic mathematical models into economic terms. The proposed computation may be subdivided into: computation of the real water level in a well from the level calculated for one square in the grid by means of prediction models; computation for one square in the grid of the number of wells that is necessary in order to obtain the required quantity of water and choice of the economically most advantageous variant (artiesian or pumped); economic computation on the regional scale, yielding a calendar of investments for water production and the mean cost per cubic meter of water and its variation with time. (See also W76-00807) (Bowden-Arizona)
W76-00819

SOME ASPECTS OF GROUNDWATER EXPLOITATION AND THE USE OF GROUNDWATER MODEL IN THE MIRES BASIN IN CRETE, GREECE.
In: Groundwater Seminar, Granada, Report of the FAO/UNDP-Goverment of Spain Seminar on the Role of Groundwater in the Optimal Utilization of Hydraulic Resources, Granada, October 18-23, 1971, Irrigation and Drainage Paper No 18. Rome, 1973, p 286-290.

Descriptors: *Groundwater, *Irrigation, *Economic feasibility, *Water resources development, *Model studies, Agriculture, Europe, Water management(Applied), Computers, Systems analysis, Mathematical models, Synthetic hydrology, Aquifer management, Water supply, Groundwater resources, Water utilization, Aquifer characteristics, Groundwater basins, Hydrologic aspects, Hydrologic subject.
Identifiers: *Greece, *Crete, Messara Valley(Crete).

The groundwater basin of Mires in the Messara Valley on the Island of Crete has an average annual groundwater flow of approximately 26 cubic hectometer out of which only about 5hm3 are being used at present. The full exploitation of the annual flow would allow irrigation of more than two times the surface of the basin area. The question is whether it will be technically and economically feasible to reach this aim, the crucial point being the pumping pattern. As an approach to the answer a digital groundwater model has been used which enabled simulation of the reactions of the hydrogeological system on varying conditions of exploitation. (See also W76-00807) (Bowden-Arizona)
W76-00820

ASSESSING SOIL SALINITY AND IDENTIFYING POTENTIAL SALINE-SEEP AREAS WITH FIELD SOIL RESISTANCE MEASUREMENTS,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 3C.
W76-00835

LIBRARY U. OF I. URBANA-CHAMPAIGN

WISCONSIN'S GROUNDWATER: AN INVALUABLE RESOURCE,
Wisconsin Univ., Madison. Cooperative Extension Programs.
For primary bibliographic entry see Field 2F.
W76-00881

NUMERICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2F.
W76-00882

GROUND-WATER LEVELS, 1968-1972,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 7C.
W76-00887

SUMMARY OF GROUND WATER QUALITY IN THE LOS ANGELES DRAINAGE PROVINCE,
California Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 7C.
W76-00888

ENVIRONMENTAL ISOTOPIC STUDY OF THE BARREMIAN-JURASSIC AQUIFER IN SOUTH DOBROGEA (ROUMANIA),
Institutul de Meteorologie si Hidrologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2F.
W76-00894

THE USE OF ENVIRONMENTAL TRITIUM TO ESTIMATE RECHARGE TO A SOUTH-AUSTRALIAN AQUIFER,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 2F.
W76-00896

OCCURRENCE AND DISTRIBUTION OF POTASSIUM IONS IN NATURAL WATERS IN INDIA,
Soil Research Lab., Chandigarh (India).
For primary bibliographic entry see Field 5B.
W76-00897

CHLORIDE CONTAMINATION IN ALUM CREEK, CENTRAL OHIO.
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 5B.
W76-00910

TEMPLETON V. HUSS (ACTION FOR INJUNCTIVE RELIEF FOR INCREASED SURFACE WATER RUNOFF).
311 N.E.2d 141 (Ill 1974).

Descriptors: *Surface runoff, *Riparian rights, *Judicial decisions, *Illinois, Runoff, Agricultural runoff, Drainage water, Water sources, Water supply, Water resources development, Water law, Surface waters, Base flow.
Identifiers: *Injunctive relief, *Common enemy rule.

Plaintiff sought injunctive relief against subdividers for converting their parcel of farmland into a residential subdivision resulting in an increase in the amount and rate of surface water runoff flowing onto plaintiff's land. Plaintiff also sought relief from the village for approving plans for the subdivision and accepting the dedication of streets when it knew or should have known that alterations of the course of nature would cause water to flow onto plaintiff's land. The defendants contended that the owner of the dominant estate has an unlimited right to alter the surfacewater drainage of his land as long as the water is not diverted from another watershed. The Supreme Court of Illinois found for the plaintiff and held that the increased flow of surface waters to the adjoining landowner was beyond a range consistent with the policy of reasonableness which led to the 'good husbandry' exception to the Drainage Act of 1885. (Proctor-Florida)
W76-00953

WATER RIGHTS,
Davis, Graham and Stubbs, Denver, Colo.
For primary bibliographic entry see Field 6E.
W76-00974

OMERNIK V. STATE OF WISCONSIN (APPEAL FROM CONVICTION FOR DIVERSION OF WATERS FROM LAKES AND STREAMS WITHOUT A PERMIT).
For primary bibliographic entry see Field 4A.
W76-00977

4C. Effects On Water Of Man's Non-Water Activities

EVALUATION OF EFFECTS OF LAND-USE CHANGES ON STREAMFLOW,
Geological Survey, Menlo Park, Calif.
D. R. Dawdy, and J. M. Bergmann.
In: Agricultural and Urban Considerations in Irrigation and Drainage: Selected Papers from the Irrigation and Drainage Division Specialty Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 619-626, 1974. 2 tab, 3 ref.

Descriptors: *Environmental effects, *Land development, *Streamflow, *Hydrologic models, *Storms, *Land use, Planning, Forecasting, Watershed management, Flood frequency, Flood data, Hydrologic data, Evaluation, Urbanization, Agriculture.

Deterministic structure-imitating hydrologic models can be an invaluable tool for predicting the changes in streamflow that will result from changes in land use. The relative magnitude of the change in streamflow resulting from a given change in land use will vary inversely with storm severity. The user of the hydrologic model should be aware of its limitations--a degree of error is inherent in every model and that error is usually compounded by uncertainties in the prediction of change in land use. (Woodard-USGS)
W76-00657

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN -- FOREST HYDROLOGY MODEL,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 4D.
W76-00672

CONTRIBUTIONS OF URBAN ROADWAY USAGE TO WATER POLLUTION,
Biospherics Inc., Rockville, Md.
For primary bibliographic entry see Field 5B.
W76-00696

THE 1973 FLOOD AND MAN'S CONSTRICTION OF THE MISSISSIPPI RIVER,
Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
For primary bibliographic entry see Field 4A.
W76-00901

SYSTEM FOR EXPLOITATION OF T 'COMMON HERITAGE OF MANKIND' AT T CARACAS CONFERENCE,
Ministry of Foreign Affairs, Nairobi (Ken Legal Div.
For primary bibliographic entry see Field 6A.
W76-00933

BIG CYPRESS NATIONAL PRESERVE (PA 2-APPENDIX).
Hearings on S. 334, S. 783, S. 920, H. R. 10 Subcomm. on Parks and Recreation, Comm. Interior and Insular Affairs, U. S. Senate, 9 Cong, 2nd Sess, March 21 and 22, 1974. 828 p, fig, 6 map, 34 tab.

Descriptors: *Environmental effects, *Waters management, *Wildlife management, *Flor *Estuaries, Evaluation, Water resources, W conservation, Governments, Legislation, Pro planning, Watershed(Basins), Control, Habitat provement, Wildlife conservation, Water cont Water supply, Hydrology, Environmental cont Identifiers: *Environmental Impact Statemer *Big Cypress, *Everglades

The Proposed Big Cypress National Fresh W Reserve involves the acquisition over a 10-y period of 547,000 acres of lands in southw Florida. Preservation of the watershed, ecosystem and water supplies of nearby citie the aim of the proposal. The area is mainly aqu and supports a diversity of rare plant and ani forms which are endangered by the draining, m ing, and other development by the surround communities. Support for preservation of the a began when the City of Miami began construct of a jetport in the area. In addition to preserv the water supply, acquisition of the Big Cypr watershed will restore the ecosystem and enha the chance of survival of the 21 rare and end gered species living there. There are no expec adverse environmental effects of the proposal no action is taken, drainage and development p jects will destroy the watershed. The other alter tive is to use methods other than acquisition preserve the area. Zoning measures appear adequate because of the time required to appr and implement regulations by several levels government. Creation of an environmental trust public corporation for control of the area invol similar problems of coordination. Federal co pensable land use regulations have never be adopted and would require federal legislation. T short-term effect of the proposal prevents furt exploration of the area's resources; the long-te effect insures preservation of the watershed. T only irretrievable commitment of land is t designated for recreational use. Supplemental s dies include an earlier Environmental Imp Statement by the Department of the Interior, an hydrologic survey by the U. S. Geological Surv (Jenkins-Florida)
W76-00970

CITY OF DAYTONA BEACH V. TONA-RAM INC. (ACTION FOR INJUNCTION T PREVENT ERECTION OF PUBLIC OBSERV TION TOWER ON BEACH).
294 So. 2d 73 (Fla 1974).

Descriptors: *Easements, *Public rights, *Le aspects, *Public acess, Riparian rights, Recr tion, Water law, Judicial decisions, Florida, Atl tic Ocean, Scenic easements, Prescriptive righ Right-of-way, Water resources development.
Identifiers: *Declaratory judgment, *Injuncti relief.

Action was brought by a municipality for declaratory judgment and injunctive relief prevent the erection of defendant's public obs vation tower on the beach. Defendant, a Flori corporation, owned waterfront property in the m nicipality and operated an ocean pier as a tour attraction and recreation center. Plaintiff c

erated an observation tower near the site of de-ndant's pier and protested the construction of efendant's tower. Plaintiff alleged that by con-nuous use of the property for more than 20 years, e public had acquired an exclusive prescriptive ght to use the land of the defendant. The preme Court of Florida held that even if the blic had acquired an easement by prescription to used areas of the defendant's ocean front par-l, the owner could make any use of the land con-stent with, or not calculated to interfere with, the ercise of the public easement. (Proctor-Florida)
76-00978

UMAN ECOLOGY. PROBLEMS AND SOLU-IONS,
or primary bibliographic entry see Field 5C.
76-00987

D. Watershed Protection

ROSION IN THE URBAN ENVIRONMENT,
hns Hopkins Univ., Baltimore, Md.
or primary bibliographic entry see Field 2J.
76-00546

YDROGRAPH RESPONSES TO WATERSHED ODEL SIZE AND SIMILITUDE RELATIONS,
ate Univ. of New York at Syracuse. Coll. of En-ronmental Science and Forestry.
or primary bibliographic entry see Field 2A.
76-00549

NVIRONMENTAL ASPECTS--SACRAMENTO ANK PROTECTION,
rmy Engineer District, Sacramento, Calif. Water esources Planning Branch.
S. Mifkovic, and M. S. Petersen.
ournal of the Hydraulics Division, Proceedings of SCE, Vol 101, No HY5, p 543-555, May, 1975. 7 g, 5 ref.

escriptors: Bank protection, *Flood control, Rivers, *Erosion control, *Watershed manage-ent, Wildlife conservation, Levees, Construc-on, Recreation facilities, *California.
lentifiers: *Sacramento Valley(Calif).

hile flood control in the Sacramento River Val-y has been practiced for several years, little con-rn was given to riparian vegetation and wildlife ong the river banks. For this reason, many aches of the Sacramento River where bank pro-ction work was performed have now eroded, pleting berm areas and attacking the levees. This per examines alternative design and construc-on practices that are under study by the Sacra-ento District, Corps of Engineers, to minimize dverse environmental effects. Some studies are ing implemented on a test basis, such as the ild and Scenic Rivers Study, which is evaluating vironmental resources and inter- relationships, ysical characteristics of the river, water quality d use, recreation potential, land use, and social d cultural development. Possible modifications preserve the environment which are being con-dered are: selective clearing and retention of getation with replacement at construction sites; storation of berm areas; steeping the protected ope to preserve existing berm areas; requiring nstruction to be from the waterside with floating uipment; reducing the top of rock revetment to a gh sustained flow level; and including recreation cilities at selected construction sites. (Kramer-RL)
76-00621

ODEL DEVELOPMENT AND SYSTEMS NALYSIS OF THE YAKIMA RIVER BASIN -- OREST HYDROLOGY MODEL,
ashington Univ., Seattle. Coll. of Forest esources.
D. Fox, and D. D. Wooldridge.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 195, $4.75 in paper copy, $2.25 in microfiche. State of Washington Water Research Center, Pullman, Report No 17E, November 1974. 75 p, 17 fig, 13 tab, 20 ref, 2 append. Partial completion report. OWRT B-036-WASH(8), B-043-WASH(9), and B-050-WASH(7). 14-31-0001-3348, -3663, and -3944.

Descriptors: *Computer models, Forests, Hydrology, *Runoff, Water balance, Watersheds(Basins), *Systems analysis, *Washington, Model studies, Computer programs, Clear-cutting, Seasonal, *Watershed management.
Identifiers: *Yakima River basin(Wash).

The basic concepts of watershed modeling are explored and a working model is developed for the forested zone areas in the Yakima River Basin of Washington. The model follows the general approach developed by Fordam at the Desert Research Institute, Reno, Nevada. Precipitation and temperature information are traslated into estimates of snowpack, snow melt, groundwater storage and, finally overland and groundwater flows. A FORTRAN program, calibrated for Yakima Basin conditions is used to estimate changes in total runoff and seasonal patterns. A particular application is made to changes in runoff following clearcut timber harvesting over various proportions of the watershed surface. (McKenzie-Washington State)
W76-00672

RELATIONSHIP OF DURATION OF FLOWS AND SELECTED WATERSHED PARAMETERS TO THE STANDING CROP ESTIMATES OF TROUT POPULATIONS,
Wyoming Univ., Laramie. Water Resources Research Inst.
R. A. Burton, and T. A. Wesche.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 197, $4.75 in paper copy, $2.25 in microfiche. Water Resources Series No 52, Dec 1974. 86 p, 14 fig, 13 tab, 22 ref, 2 append. Partial completion report. OWRT B-023-WYO(1). 14-31-0001-4143.

Descriptors: *Streamflow, *Flow duration, *Fish populations, *Trout, Standing crops, Average flow, *Watershed management, Fish reproduction, *Wyoming, Average flow.
Identifiers: Trout productivity, Watershed parameters, Minimum streamflow, Average daily flow.

The objectives were twofold: to aid in determining suitable streamflow recommendations for trout through the use of flow duration values, and to develop an index of potential trout productivity, utilizing watershed parameters that were found to be significantly related to standing crop estimates. The 25 percent recommended average daily flow level was equaled or exceeded an average of 55 percent of the time during the summer months in streams with good trout populations, as compared to an average of 15.8 percent of the time in streams with poor populations. Seven watershed parameters were significantly related to standing crop estimates in small Wyoming streams. Four of them--drainage area, total stream length, mean basin elevation, and forested area--were utilized in developing an index equation for the potential trout productivity. Calculated results of the index show a general relationship between geomorphic characteristics and standing crop estimates.
W76-00674

APPLICATION OF MICROWAVE WATER SENSING TECHNIQUES TO WATERSHEDS,
Montana State Univ., Bozeman. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7B.
W76-00675

REHABILITATION OF LAND DISTURBED BY SURFACE MINING COAL IN ARIZONA,
Arizona Univ. Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 5G.
W76-00709

THE POTOMAC, 1974 ANNUAL REPORT.
Interstate Commission on the Potomac River Basin, Bethesda, Md.
Annual Report, 1974. 26 p, 4 illus, 18 photo, 1 chart.

Descriptors: *Watersheds(Basins), *Potomac River, *Interstate commissions, *Pollution abatement, *History, Maryland, Virginia, District of Columbia, Acid mine water, Administrative agencies, Algal control, Sedimentation, West Virginia, Dams, Reservoirs, Swimming, Water purification, Watershed management, Federal Water Pollution Control Act, Industrial wastes, Flood control, Water sampling.
Identifiers: Shenandoah River, Non-point pollution, Cancer producing agents, Drinking water, Interstate Commission on the Potomac River Basin(ICPRB).

Improvements are depicted that have been made in the Potomac River watershed. Beginning with a Presidential declaration in 1965 that the Potomac would be safe for swimming within ten years, a sustained multi-state effort has reclaimed waters from mine acid contamination, insufficient sewage treatment, and various types of non-point source pollution such as land runoff that add sediment thereby clogging areas downstream. Since the Potomac basin supplies drinking water for millions of people in the Maryland--Virginia--District of Columbia area, the discovery of possible cancer producing agents in Potomac waters has stimulated great concern. However, control projects such as dams and reservoirs are not always popular since the area is heavily populated and of great historical importance. The main responsiblity for reclaiming the river and for reconciling the diverse needs of its users rests with the Interstate Commission on the Potomac River Basin (ICPRB), established in 1940. Under the 1972 Amendments to the Federal Water Pollution Control Act, the Commission's activities have greatly expanded to include all areas of river supervision. (Parrish-Florida)
W76-00935

MAJOR FLOODS, POOR LAND USE DELAY RETURN OF SEDIMENTATION TO NORMAL RATES,
Forest Service (USDA), Berkely, Calif. Pacific Southwest Forest and Range Experiment Station.
H. W. Anderson.
Research Note PSW-268, 1972. 4 p, 1 fig, 1 tab, 9 ref.

Descriptors: *Watershed management, *Forest management, *Lumbering, Grasslands, *Erosion, Suspended sediment, *Water quality, *Floods, Geomorphology, Sediment transport, Forecasting, *Land use.
Identifiers: Logging effects, Vegetation type conversion, Sediment delivery processes.

When suspended sediment concentrations are suddenly accelerated by factors of 5 or more the hydrogist making predictions of long-term sedimentation is in trouble. Recovery from flood accelerated sedimentation influences both estimates of average long-term sedimentation and short-term monitoring of sedimentation changes. But, these accelerations and their decline are at least in part predicable. Analyses of the 'years to return to normality' were made for 10 northern California watersheds following the accelerations in average sediment concentration associated with the December 1964 flood. Returns to normalcy took from zero to 9 years, with the rate of decline being related both to the amount of initial acceleration

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and watershed differences. Explained variance in years to recovery increased with the coefficient of path lengths in the watershed, with the area of poor logging, with the area of steep grassland, and with the percent of area in the sedimentary rock types Cenozoic or younger. Thus, part of the delayed recovery was attributed to sediment in transit released by the major flood and part to recovery of sediment source areas from the impact of the floods. Sediment determinations during flood versus non-flood periods may alter estimates by a factor of 2 or more. (Forest Service)
W76-00989

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE EFFECTS OF STREAM CHANNELIZATION OF THE DISTRIBUTION OF NITRIENTS AND METALS,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W76-00501

ASSESSMENT AND DEVELOPMENT PLAN FOR MONITORING OF ORGANICS IN STORM FLOWS,
Raytheon Co., Portsmouth, R.I.
A. Molvar, and A. Tulumello.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 810, $4.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-087, December, 1974. 88 p, 20 fig, 10 tab, 20 ref.

Descriptors: *Storm runoff, *Overflows, *Monitoring, Organic compounds, Infrared radiation, Sewage disposal, Analytical techniques, Storm water, Rivers, Automation, Organic wastes, Pollutant identification.
Identifiers: *Total Organic Carbon(TOC).

A method for assessing the organic content of incoming combined sewage during storm water periods is necessary to permit programming overflows. The ultimate objective of this study was to design a device for the automatic and rapid on-site monitoring loading of strom and combined sewer flows. Evaluation of the instrumentation necessary for a reliable Total Organic Carbon (TOC) measurement indicated that the best system would be one based on total oxidation of sewage and infrared detection of the carbon dioxide. Although no commercially available automatic monitoring system is suitable for sorm water service, it is believed that most of the components to build such a system are available. Tests are being conducted to establish sample processing, modifications on the engineering model, and accumulation of the continuous monitoring data on TOC content of storm and combined sewers. (Kramer-FIRL)
W76-00507

GROUNDWATER POLLUTION FROM SUBSURFACE EXCAVATIONS, PART XI, TANK AND PIPELINE LEAKAGE.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00528

SOME OBSERVATIONS CONCERNING PREPARATION AND STORAGE OF STREAM SAMPLES FOR DISSOLVED INORGANIC PHOSPHATE ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
A. H. Johnson, D. R. Bouldin, and G. W. Hergert.
Water Resources Research, Vol 11, No 4, p 559-562, August 1975. 3 fig, 4 tab, 9 ref.

Descriptors: *Pollutant identification, *Phosphates, *Phosphorus compounds, Surface waters, Storage, Storage requirements, Analytical techniques, *Sampling, Inorganic compounds, Phosphorus, Dissolved solids, Streams, Rivers, Water storage, Preservation, Spectrophotometry, Chemistry, Evaluation, Instrumentation, Laboratory tests, Freezing, Refrigeration, Analysis, *New York.
Identifiers: *Dissolved inorganic phosphate, Sample storage, Chemical preservatives, *Fall Creek(NY), Stream samples, Isobutanol extraction procedure, Autoanalyzer.

The influence of storage conditions and duration of storage was studied by using about 100 stream samples from Fall Creek collected near Ithaca, New York. Freezing and refrigerated storage were found to be unsatisfactory, since changes in measured concentrations were usually observed after relatively short periods of time (24 hours). An isobutanol extraction procedure was described which minimizes storage problems and is useful for routine analysis of water samples for dissolved inorganic phosphate. (Henley-ISWS)
W76-00538

EMPIRICAL METHODS OF USING SOILS AS RADIATION DOSIMETERS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
H. Nishita, and M. Hamilton.
Soil Science, Vol 120, No 2, p 96-106, August 1975. 7 fig, 5 tab, 12 ref. ERDA AT(04-1) GEN-12.

Descriptors: *Pollutantidentification, *Radiation, *Soil tests, *Analytical techniques, *Irradiation, *Instrumentation, Soil analysis, Saline soils, Soil chemical properties, Calcareous soils, Radioactivity, Chemical analysis, Chemical properties, Nuclear explosions, Radioecology, Safety, Environmental effects, Soil chemistry, Ecosystems, Cobalt.
Identifiers: *Radiation dosimeters, *Thermoluminescence characteristics, *Dosimeters, Ionizing radiation, Radiation exposure, Glow curve area, Exposure level, Cobalt 60.

Two empirical methods oflusing soils as ionizing radiation dosimeters were presented. These methods were derived through the use of the thermoluminescence characteristics of soils. Method A was designed for irradiated soils for which pre-irradiation collection of the soils was available. This method is workable for maximum radiation exposure levels up to about 480,000 roentgens. Method B was designed for irradiated soils for which pre-irradiation collection of them was not available. This method is workable for maximum radiation exposure levels up to about 5,000 roentgens. Some of the reasons for the discrepancy in the sensitivity between the two methods were discussed. Various factors that influence the measurement of soil thermoluminescence were noted. (Henley-ISWS)
W76-00542

A DUAL-INTERVAL, LIGHT-ACTIVATED SIGNAL GENERATOR--ITS APPLICATION TO SEDIMENT SAMPLING,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2J.
W76-00543

PREPARING AN INFILTRATION/INFLOW ANALYSIS,
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 5D.
W76-00564

METHOD AND APPARATUS FOR MONITORING AND CONTROLLING HALOGEN LEVELS IN A WATER TREATMENT SYSTEM,
For primary bibliographic entry see Field 5F.
W76-00576

ALKALINITY CALCULATIONS IN WATE
Kiriat-Yam 'G', Haifa (Israel)
For primary bibliographic entry see Field 2K
W76-00599

GAS CHROMATOGRAPHIC DETERIMINATION OF COPROSTANOL CHOLESTEROL AS INDICATORS OF F POLLUTION IN WATER, (IN JAPANESE)
Ehime Univ., Matsuyama (Japan). De Chemistry
H. Matsushima, T. Wakimoto, and R. Tatsul
Bunseki Kagaku, (Japan Analyst), Vol 24, N 342-345, June, 1975. 3 fig, 1 tab, 4 ref.

Descriptors: *Pollutant identification, *Wat lution sources, *Gas chromatog *Monitoring, Environmental effects, disposal, *Bioindicators.
Identifiers: Coprostanol, Cholesterol, F wastes, Fecal pollution, Electron capture tors.

A gas chromatographic method for the dete tion of coprastanol and cholesteral as indica fecal pollution in water is described. Copro (5 beta-cholestan-3 beta-ol) is one of the fecal sterols excreted by man and livestock a good indicator of fecal pollution. Thu method is applicable to the determination o amounts of coprostanol in seawater in or monitor the disposal of human and animal in the marine environment. Coprostano cholesterol extracted with n-hexane were sil with bromomethyldimethylchlorosilane (Bl reaction products were determined by a gas matograph equipped with an electron captu tector. The detection limits were 10 ng/lit coprostanol and 20 ng/liter for cholesterol. limits were 10,000 times less than those of th ventional procedure. (Kramer-FIRL)
W76-00602

NEW ORLEANS DRINKING WATER SOU TESTED BY GAS CHROMATOGRAPHY SPECTROMETRY, OCCURRENCE ORIGIN OF AROMATICS HALOGENATED ALIPHATIC HYDRO BONS,
New Orleans Univ., La. Dept. of Biol Sciences.
B. J. Dowty, D. R. Carlisle, and J. L. Laseter
Environmental Science and Technology, V No 8, p 762-765, August, 1975. 3 fig, 3 tab, 9 r

Descriptors: *Water analysis, *Organic pounds, *Potable water, Water sources, Ar cal techniques, Pollutant identification, Wate lution sources, Chlorination, Gas chrom raphy, Mass spectrophotometry, *Loui *Aromatic compounds.
Identifiers: *Chlorinated hydrocarbons, *Ne leans(La), *Aliphatic compounds.

Low molecular weight volatile organic compo were thermally extracted from water sample fore, during, and after processing by a New ans, La., municipal water treatment plant. Be artesian water and water from a charcoal filt deionizing unit were also examined. The vo compounds were trapped on a solid polyp ether adsorbent and resolved by high resol gas chromatography. A gas chromatograph-spectrometer-computer combination was us identify major aromatic and halogenated alip components. About 70 organic constituents c detected in any single analysis of liter size. Mo these organics are either aromatic or haloge aliphatic and aromatic. The major constituer finished water are benzene, carbon tetrachlo dichloroethane, bromodichloromethane, chloroform. The concentrations of halogenated and aromatic organics such trichloroethylene, 2- or 1-naph dichloromethane, and xylene are unchange passing through the treatment plant. The co

ions of dichloroethylene, chloroform, zene, carbon tetrachloride, dichloroethane, modichloromethane, toluene, and romochloromethane are enhanced greatly in water treatment process. This increase in contrations indicates that they are formed by orination of precursor organic molecules. The anics in the bottled artesian water were the ne as those in the finished water. Variations in anics present and their relative concentrations ied from bottle to bottle. The preliminary data gests that further studies are needed to deter- ne the value of charcoal filtering for potable er production. (Orr-FIRL)
6-00603

TER MONITORING STATIONS,
neywell, Inc., Minneapolis, Minn.
. Johnson, Jr.
ter and Sewage Works, Reference Number, p 78, R180-182, R184-R185, April 30, 1975. 11 fig, ef.

scriptors: *Pollutant identification, *Waste er treatment, *Monitoring, *Measurement, In- mentation, Equipment, Water quality control, nps, Pipelines, Data transmission.

uipment and systems for monitoring water lity parameters both in plant and streamside discussed. In-situ system measurement makes of a submersible cluster of sensor which mea- e the parameters at the point of submersion. s is a simple system to use when environmental ditions permit. The most common method of aining water samples is to pump from the rce to some location where the sensors are used. This system is characterized by the arately mounted pump with piping to the mea- ing equipment which is located in a separate lter or space within the plant. The factors ich aid in a determining the location of the sam- g site and the mounting and anchoring facilities lude the type of water, annual water level data, l flood level and flood history. The kind of ris that may be in the water course should also considered when choosing the type of equip- nt and site. The preferred pump is the positive placement type. The most common method of unting is to support the pump by a pipe from a r, truss, bridge, or bulkhead. A pump can be unted in a still well for protection from the ather. A slanted stillwell is becoming increas- ly popular. Debris screens will help to keep the ris out of the system but many of the available eens are difficult to position and too small. The mbing can be critical because of the debris. The ing should be laid out to minimize sharp bends, nges in cross section, and areas for sediment to lect. The pressure regulation that most systems uire in order to function properly can be ac- nplished with a bypass or discharge valve. (Orr- RL)
6-00605

EMICAL COMPOSITION OF ORGANIC MPOUNDS PRESENT IN WATER OF THE MAGAWA RIVER, (IN JAPANESE),
Ogura, Y. Ambe, and K. Ogura.
usui Gaku Zasshi, (Japanese Journal of Lim- ogy), Vol 36, No 1, p 23-30, January, 1975. 2 , 7 tab, 17 ref.

scriptors: *Organic matter, *Rivers, *Pollutant ntification, Filtration, Detergents, Organic npounds, Water pollution sources.
ntifiers: Dissolved organic matter, pan(Tamagawa River).

investigation was conducted to determine the emical composition of dissolved organic matter OM) in the water of the Tamagawa River, near kyo, in November 1972 and May and November 73. Samples were filtered through glass fiber fil- s for analysis. The percentage of each chemical mponent to the total DOM was as follows: carbohydrates, 16-18%; protein, 29-36% (amino acids, 25%); lipids, 3%; urea, 1%; and ABS, 9-16%. The percentage of protein (nitrogen containing compounds) was larger than that of lipids (ether extractable compounds) was smaller than had been observed in seawater samples. ABS derived from detergents was also present in large amounts in the Tamagawa River samples. In addition, trace organic compounds including fatty acids, sterols, polyaromatic hydrocarbons, BHC and phthalate esters were found in these samples. (Kramer-FIRL)
W76-00606

DETERMINATION OF ORGANIC CARBON IN WATER USING A PCO2 ELECTRODE, (IN JAPANESE),
Asahi Glass Co., Yokohama (Japan). Research Lab.
M. Noshiro, and T. Yarita.
Bunseki Kagaku, (Japan Analyst), Vol 24, No 6, p 390-391, June, 1975. 1 fig, 1 tab.

Descriptors: *Organic matter, *Pollutant identification, *Electrodes, Analytical techniques, Measurement.
Identifiers: *Total organic carbon, Sensors, PCO2 measurement.

The concentration of total organic carbon in water may be measured with a PCO2 electrode as a sensor. The feasibility of this method was studied. Because nitrogen in air is coverted into NOx which interferes with the PCO2 measurement, oxygen carrier gas (300 ml/min) rather than air, was used. A sample combustion chamber was maintained at 800 C and an oxidation chamber was operated at 600 C. Carbonaceous materials were oxidized to carbon dioxide with a Pt-Rh catalyst on alumina; water vapor was removed at room temperature by a cooling trap; carbon dioxide was absorbed in 2 ml of 0.5 M NaOH solution. The solution was acidified with one ml of 2 M HCl and introduced into a cell, where the potential of a PCO2 electrode could be measured. The content of total organic carbon in the sample was calcualted from a calibration curve obtained with the standards solution in the same manner. Analysis time was about eight minutes, precision about plus or minus 20%. (Kramer-FIRL)
W76-00607

DEVELOPMENT OF A GROSS POLLUTION DETECTOR: LABORATORY STUDIES,
Severn-Trent Water Authority, (England).
G. J. Holland, and A. Green.
Water Treatment and Examination, Vol 24, Part 2, p 81-99, 1975. 6 fig, 6 tab, 4 ref, 2 append.

Descriptors: *Monitoring, *Water pollution, *Nitrification, *Ammonia, *Pollutant identification, Rivers, Toxins, Water pollution sources, Water quaility, Analytical techniques, Electrodes.
Identifiers: Ammonia-ion electrode.

The development and testing of a gross pollution detector (GPD) is discussed. The monitoring system was based on a continuously operating percolating filter in which nitrifying organisms were selectively cultured. A specific-ion electrode was used to indicate changes in the rate of nitrification of ammonia. Numerous compounds have been found which could inhibit nitrification. The media was carefully graded 20 mm granite chippings, supported in a PVC tube. The term 'Toxicity threshold concentration' was devised from the relative toxicities of the substances tested and means 'that concentration of pollutant which will bring about a 50% inhibition of nitrification'. The toxicity threshold concentration is determined by plotting the maximum percentage inhibition against concentration for each of the concentrations used and determining the concentration that would result in 50% inhibition. The investigation showed the basic soundness of the concept of using the automatic detection of the inhibition of nitrification as a warning of the presence of pollution. More evaluations of this monitoring system should be performed. (See also W76-00610) (Orr-FIRL)
W76-00609

DEVELOPMENT OF A GROSS POLLUTION DETECTOR: FIELD TRIALS,
Severn-Trent Water Authority, (England).
K. C. G. Stroud, and D. B. Jones.
Water Treatment and Examination, Vol 24, Part 2, p 100-119, 1975. 7 fig, 1 ref, 1 append.

Descriptors: Rivers, *Pollutant identification, On-site tests, Potable water, Effluents, Ammonia, Waste water treatment, *Inhibition, *Analytical techniques.
Identifiers: Gross pollution detectors.

A detector for gross pollution in rivers was developed by the Severn-Trent Water Authority, Great Britain. The operating principle of the detector is based on the inhibition of pollutants by bacteriological oxidation of ammonia in a nitrifying column. Field trials on a series of rivers were conducted in order: to identify and try to overcome problems associated with using the gross pollution detector on actual river sites; to determine if the detector could be developed into a reliable plant which could be installed at any station; and to learn how well the detector operated on rivers carrying a range of pollution loads. Field trials were conducted on the following rivers: Severn, a relatively unpolluted river but one often having high turbidity and used for water supply; Bourne, a smaller river used for potable water, carrying effluents from several sewage works, having heavy silt during flood periods; Blythe, having a high proportion of sewage effluents for a potable water source; Cole, polluted and not a water supply source; and Tame, badly polluted. After two years of trials and improvements, the reliability of the nitrifying column and the specific ion electrode for ammonia were demonstrated. Once the nitrifying column had achieved its optimum efficiency it ran for several months continuously and the ammonia concentration in the effluents was not affected by other river characteristics. (See also W76-00609) (Kramer-FIRL)
W76-00610

USE OF A MOBILE LABORATORY FOR POLLUTION DETECTION,
Bristol Waterworks (England).
E. R. Gardiner, and L. R. Bays.
Water Treatment and Examination, Vol 24, Part 2, p 120-131, 1975. 1 ref, 1 append.

Descriptors: *On-site laboratories, *Pollutant identification, Rivers, Phenols, Heavy metals, *Analytical techniques, Laboratory equipment, Water pollution control.
Identifiers: *Mobile laboratory, Gross pollution detector, Severn River Authority.

The function of a vehicle for pollution detection in rivers is discussed. This mobile laboratory has been designed for immediate action in the case of pollution and not as a replacement for existing fully-equipped laboratory facilities. Since the development of a Gross Pollution Detector by the Severn River Authority, an increased number of warnings should be given, and it is hoped that the mobile laboratory will facilitate faster identification of point source pollutants. The mobile laboratory should be able to arrive at a site, take a sample for immediate analysis and one for a retention and return to the main laboratory, place two guppies in a portion of the sample for observation, and run several analyses such as odor, visible pollution, pH, temperature, dissolved oxygen, organophosphorus, organochlorines, and heavy metals. In two cases cited, the mobile laboratory was able to detect and trace the source of pollution discharges within two to three hours of dispatch. The specific laboratory methods employed by the

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mobile unit to detect phenols, arsenic, ammonia, heavy metals, lead, copper, zince, hexavalent chromium, cadmium, cyanide, thiocyanate, organophosphorus compounds, organochlorine compounds, and herbicides are outlined. (Kramer-FIRL)
W76-00611

X-RAY FLUORESCENCE ANALYSIS OF TRACE METALS IN WATER BY MEANS OF CONDENSATION DEPENDING ON ADSORPTION BY ACTIVE CARBON (KASSEI TAN KYUCHAKUHO NI YORU SUICHU BIRYO KINZOKU GENSO NO KEIKO X-SEN BUNSEKI),
M. Yamaguchi, and H. Shiio.
Nagoya-shi Kogyo Kenyusho Kenkyo Hokoku, (Research Report of Nagoya Municipal Industrial Research Institute), No 53, p 5-8, 1975. 10 fig, 1 tab, 5 ref.

Descriptors: *Pollutant identification, *Trace elements, *Metals, *Copper, Nickel, Chromium, Analytical techniques, Spectroscopy, X-ray spectroscopy, Chelation, *X-ray fluorescence.
Identifiers: Japan, EDTA, Trace metals.

The trace metals Cu, Ni, and Cr in water were analyzed by chelation with EDTA, followed by adsorption on activated carbon, placement of the carbons on coated filter paper with PVA, and x-ray spectrography. The x-ray intensity of adsorbed activated carbon with the chelated metals was two times that of non-chelated metals. The sensitivities, when 0.2 g activated carbon were added to 100 ml analytical water, were 0.1 ppm for copper, 0.04 ppm for nickel, and 0.04 ppm for chromium. The three types of trace metals may be analyzed by x-ray techniques simultaneously, as one does not affect the accuracy of the measurement of the others. (Kramer-FIRL)
W76-00612

A CONTINUOUS GARGANTUAN TASK FOR SEVERN TRENT,
Severn Trent Water Authority (England).
D. Brewin, and J. Tapson.
Water, No 4, p 23-26, July, 1975. 3 ref.

Descriptors: *Water supply, *Administration, *Water treatment, *Waste water treatment, *Data collections, Publications, Water quality control, Water analysis, Water districts.
Identifiers: *Severn Trent Water Authority (UK).

As one of its first tasks the Severn Trent Water Authority commissioned 'Water Quality 1973', a document containing in one volume water quality data covering the whole water cycle. The preparation of this report is discussed. The report required data collection from a variety of sources and this variety led to many difficulties in unifying the data presentation. In addition there were also legal difficulties and many unforeseen problems. Prior to April 1, 1974, the management of water services was the responsibility of 26 statutory water undertakings, 210 local authorities, two drainage authorities and two river authorities within the Severn Trent area. Most of the former authorities had water quality data already processed and on file. It was decided to use this data, obtained over a period immediately prior to reorganization, in 'Water Quality 1973'. Gathering of the data required for the production of 'Water Quality 1973' highlighted the inadequacies of much of the data. 'Water Quality 1973' is the baseline report of water quality in the Severn Trent Water Authority. It consists largely of tables of figure; the figures are also illustrated by pie diagrams and colored maps. (Orr-FIRL)
W76-00640

STUDIES ON FLOC-FORMING SUBSTANCES IN ACTIVATED SLUDGE. II. FLOC-FORMING ACTION BY THE VISCOUS SUBSTANCE EXTRACTED FROM ACTIVATED SLUDGE BY ALKALINE SOLUTION. (IN JAPANESE),
Gifu College of Pharmacy, (Japan).
For primary bibliographic entry see Field 5D
W76-00645

ORGANIC CONTAMINANTS IN WATER SUPPLIES.
American Water Works Association, New York Committee on Organic Contaminants
Journal of the American Water Works Association, Vol 67, No 8, p 418-424, August, 1975. 5 fig, 3 tab, 12 ref.

Descriptors: *Water treatment, *Organic compounds, *Monitoring, *Pollutant identification, *Analytical techniques, Water analysis, Chemical analysis, Potable water, Water quality control, Gas chromatography, Water supply.
Identifiers: Carbon adsorption method(CAM), High-flow CAM, Low-flow CAM, Organics-carbon adsorbable test, Carbon chloroform extract(CEE), Carbon alcohol extract(CAE).

The findings of the subcommittees of the AWWA Committee on Organic Contaminants in the areas of organic contaminants in water supplies and the status of detection methods are reported. Standard monitoring procedures for organic contaminants involve three variations of the carbon adsorption method (CAM): the high-flow CAM (CAM-hf); the low-flow CAM (CAM-lf); and, the organics-carbon adsorbable (O-CA) test. The following recommendations were offered by the committee. The organic contaminant content of the water should be monitored continuously before and after treatment. The O-CA technique seems to be a promising technique for this monitoring. The historical carbon chloroform extract (CCE) and carbon alcohol extract (CAE) data retrieved from STORET should be subjected to extensive study and statistical evaluation. The concentration and cleanup step in the analysis of trace organics needs to be thoroughly investigated. Available procedures for this step, such as carbon or macromolecular resin adsorption, freeze concentration, and solvent extraction, should be qualitatively and quantitatively evaluated, improved, and possible automated to facilitate wider application. Research should be performed to improve rapid gas chromatography techniques for water quality control. The interfaced gas chromatograph-mass spectrometer-computer system for organic analysis should be further developed. Its application in water treatment should be demonstrated. (Orr-FIRL)
W76-00647

GROUND-WATER BASIC DATA FOR GRANT AND SIOUX COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. DAK.
For primary bibliographic entry see Field 7C.
W76-00653

GROUND-WATER QUALITY IN INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. W. Warner.
Available from the National Technical Information Service Springfield Va. 22161. Water-Resources Investigations 8-75, June 1975. 59 p, 24 fig, 1 plate, 5 tab, 20 ref.

Descriptors: *Pollutant identification, *Water quality, *Groundwater resources, *California, *Deserts, *Chemical analysis, Sampling, Water wells, Aquifer characteristics, Water properties, Water utilization, Water supply, Groundwater movement, Environmental effects, Sewage lagoons, Infiltration, Water pollution,
Identifiers: *Indian Wells Valley(Calif), *Mojave Desert.

Indian Wells Valley is in a semiarid region of the Mojave Desert, Calif. The U. S. Naval Weapons Center at China Lake and the communities of Ridgecrest, Inyokern, and China Lake depe
an adequate source of groundwater. Indian
Valley is a virtually closed basin with li
available groundwater and much of the gr
water is of poor quality. Most of the ground
pumping occurs in the Inyokern, intermediate
Ridgecrest areas. The quality of groundwa
these areas is considered excellent for publ
The quality of the groundwater deteriorates
depth in the central part of the valley from
than 300 mg per litre dissolved solids at a dep
300 feet to about 1,000 mg per litre at a dep
800 feet. As water levels in wells in the ar
pumping depressions continue to decline a gr
proportion of the water pumped from these
will come from the deeper part of the aq
causing a trend toward increase in concentra
of dissolved solids. (Woodard-USGS)
W76-00658

**INVESTIGATION OF THE ORION RESEA
CYANIDE MONITOR,**
Environmental Protection Agency, Cinci
Ohio.
R. J. O'Herron.
Available from the National Technical Info
tion Service, Springfield, Va 22161. Environ
tal Protection Agency, Report EPA-670/4-75
April 1975. 24 p, 5 fig, 6 tab, 9 ref. 1HA327; R
01AAD, TASK 02C.

Descriptors: Activity coefficients, *Metals,
formance, Evaluation, *Monitoring, Electr
Instrumentation, Ions, *Pollutant identificatio
Identifiers: *Cyanides, *Metals complexes,
ions, Ionic interferences, Ionic strength,
selective electrode, Reagent additions, Sp
ion electrodes.

The model 1206 Orion Research cyanide mo
was investigated using the Orion specifica
and environmental considerations as a g
Laboratory tests under controlled environm
conditions showed the electronic stability (dri
be within 0.1% over the temperature range of
35C. Sensor stability, over the temperature
5C to 35C was tested by applying free cyanid
(standard solutions of 1 mg/l and 10 mg/l) as d
input to the monitors. The results of these
showed that Orion's specified tolerance of pl
minus 10% of reading was met. Two out of
electrode sets tested for linearity were w
Orion's tolerance of plus or minus 0.02 ppm b
0.25 ppm and plus or minus 10% of readings a
0.25 ppm. Dyanmic on-stream measurements
made from a metal plating process rinse strea
a field installation of the monitor, and these
surements were periodically compared with t
of the standard method for total cyanide. This
installation revealed the comparisons were w
variable. Steady-state comparisons were mad
field-collected samples with the standard me
for determining total cyanide. These tests reve
that a 15% to 20% loss in cyanide concentr
resulted from the required straining and filteri
the sample input to the monitor. (EPA)
W76-00677

**SCIENTIFIC AND TECHNICAL ASSESSM
REPORT ON PARTICULATE POLYCYC
ORGANIC MATTER.**
Environmental Protection Agency, Research
angle Park, N. C.
Available from the National Technical Info
tion Service, Springfield, Va 22161, as PB-241
$4.75 in paper copy, $2.25 in microfiche. Env
mental Protection Agency, Report EPA-600/
001, March 1975. 1AA001.

Descriptors: Organic matter, Reviews, Ev
tion, Organic compounds, Pollutant identifica
Air pollution effects.
Identifiers: Polycyclic organic compou
Benzo(a) pyrene.

review and evaluation is presented of the cur-
nt knowledge of particulate polycyclic organic
tter in the environment as related to possible
leterious effects on human health and welfare.
urces, distribution, measurement, and control
hnology are also considered. Results of an ex-
sive literature search are presented. Experi-
nts have shown a number of polycyclic organic
mpounds to be carcinogenic in animals.
though these same compounds have not been
ven to be carcinogenic in humans, evidence
ongly suggests that they may contribute to the
rban factor.' In American males, the urban lung
ncer death rate is about twice the rural rate,
en after adjustment for differences in smoking
bits. Evidence suggests significant differences
tween specific urban areas across the United
ates. The bulk of the available data is in terms of
nzo(a)pyrene; so this compound has been used
an index on particulate polycyclic organic
atter. Average seasonal concentrations of BaP in
e ambient atmosphere range from less than
g/m3 in nonurban areas to a maximum of 50
/m3 in rural areas. (EPA)
76-00682

EWERAGE SYSTEM MONITORING AND EMOTE CONTROL,
etroit Metro Water Dept., Mich.
or primary bibliographic entry see Field 5D.
76-00691

CA IN IRRIGATION WATER AFTER BANK REATMENTS FOR WEED CONTROL,
gricultural Research Service, Prosser, Wash. Ir-
gated Agriculture Research and Extension
enter.
or primary bibliographic entry see Field 5B.
76-00706

ITROGEN-15 VARIATIONS IN FERTILIZER ITROGEN,
ernforschungsanlage, Juelich (West Germany).
nstitut fuer Physikalische Chemie.
. D. Freyer, and A. I. M. Aly.
ournal of Environmental Quality, Vol 3, No 4, p
05-405, Ocotober-December, 1974. 1 tab, 11 ref.

Descriptors: *Fertilizers, Nitrogen, *Ammonium
ompounds, Fertilization, Nitrate, *Pollutant
dentification.
dentifiers: Ammonia-nitrogen, Nitrogen-15.

Nitrogen-15 concentrations of some commonly
sed nitrogen fertilizers are measured. Ammoni-
m-nitrogen has lower and nitrate-nitrogen has
igher 15 (N) concentrations than atmospheric
itrogen. (Skogerboe-Colorado State)
V76-00722

A SURVEY OF THE BORON CONTENT OF CERTAIN WATERS OF THE GREATER LON-DON AREA USING A NOVEL ANALYTICAL METHOD,
Anglian Water Authority, Huntingdon (England).
Directorate of Scientific Services.
. J. Matthews.
Water Research, Vol 8, No 12, p 1021-1028,
December, 1974. 1 fig, 7 tab.

Descriptors: *Pollutant identification, Water anal-
ysis, *Boron, *Aquatic environment, *Sewage,
Sewage effluents, *Analytical techniques, Water
quality, Water pollution.
dentifiers: *London area(England).

Natural levels of boron, (As boric acid), in the
aquatic environment have been raised artificially
n certain areas by sewage effluents. Boron is
present in sewage effluent by virtue of the use of
sodium perborate as a whitener is washing pow-
ders. A novel analytical method based on the sol-
vent extraction of ferroin borodisalicylate was
used in a survey of various types of sewage, sewage effluent and natural waters in the London area. The method was satisfactory under all conditions. The data obtained will be useful in water resource planning and indicated that the concentration of boron in a watercourse may be used, under certain conditions, to determine the degree of dilution of sewage effluent in the watercourse. (Skogerboe-Colorado State)
W76-00727

BIODEGRADATION OF AQUATIC POLLUTANTS,
Rhode Island Univ., Kingston. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-00821

FURTHER STUDIES OF THE INTERACTION OF CHLORINE AND ORGANIC MOLECULES IN WATER,
Rhode Island Univ., Kingston. Dept. of Pharmacology and Toxicology.
Y. Shimizu.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 274, $3.25 in paper copy, $2.25 in microfiche. Completion Report, (1975). 12 p, 6 fig, 1 tab, 10 ref. OWRT B-057-RI(1). 14-31-0001-4124.

Descriptors: *Chlorination, Amino acids, Lignins, Chlorine, Organic acids, *Pollutant identification.
Identifiers: *Nucleic acids, Vanillin, Caffeine, RNA, DNA.

The existence of nucleic acids and their derivatives in water has been reported. Unexpectedly large amounts of chlorine are incorporated into the nucleic acids, both RNA and DNA. Chlorine attacks the pyrimidine derivatives of nucleic acid first, then attacks the purine derivatives of nucleic acid destructively to form small fragments. 5-Chlorocytosine and 5-chlorouracil were isolated from the chlorinated RNA. 5-Chlorocytosine but no chlorinated thymine derivatives were isolated from the chlorinated DNA. Lignins were chlorinated with chlorine in water to 17% chlorine content. Vanillin is susceptible to chlorination but caffeine is not.
W76-00822

DISSOLVED OXYGEN DEPLETION IN STATIC BIOASSAY SYSTEMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. fo Fisheries and Wildlife Sciences.
C. B. Schreck, and P. Brouha.
Bulletin of Environmental contamination and Toxicology, Vol 14, No 2, p 149-152, August 1975, 3 tab, 20 ref.

Descriptors: *Biomass, *Bioassay, *Dissolved oxygen, *Decomposing organic matter, Fish, Water quality, Laboratory tests, Water pollution effects, *Toxicity.
Identifiers: *Bluegill, *Lepomis macrochirus, *Dead fish.

Dead individuals in an aquatic bioassay were found to influence the toxicity of test substances to the remaining living fish within the system. Test results indicated an inverse relationship between dead fish (Bluegill, Lepomis macrochirus) biomass and the dissolved oxygen in the system. The greater the amount of decomposing tissue the more rapid was the decline in oxygen from saturated levels. (Klein)
W76-00869

MERCURY IN FISH IN THE DERWENT ESTUARY, TASMANIA, AND ITS RELATION TO THE POSITION OF THE FISH IN THE FOOD CHAIN,
Commonwealth Scientific and Industrial Research Organization, Hobart Australia. Tasmanian regional.
D. A. Ratkowsky, T. G. Dix, and K. C. Wilson.
Australian Journal of Marine and Freshwater Research, Vol 26, No 2, p 223-232, July 1975. 1 fig, 5 tab, 25 ref.

Descriptors: *Heavy metals, Fish, *Mercury, *Food chains, Sampling, Analytical techniques, Speciation, Estuaries, *Australia, Estuaries, *Pollutant identification.
Identifiers: *Bioaccumulation, *Finfish, *Tissue analysis, Platycephalus bassensis, *Derwent estuary(Tasmania).

Total mercury concentrations were reported for 258 individuals representating 16 species of finfish from the Derwent Estuary, Tasmania. Mercury concentrations in the muscle tissue varied between 0 and 2.0 milligrams/kilogram in one specimen of shark. Irrespective of species, the area containing Ralphs Bay contained a higher precentage of fish with mercury concentrations> 0.5 milligrams/kilogram than any other area of the estuary. The fish's position in the food chain appeared to be an important factor determining its mercury content. 51% of individual fish of species whose diet consisted of other fish had mercury concentrations > 0.5 milligrams/kilogram. In contrast, 24% of invertebrate predators and only 7% of individuals of herbivorous habit and mercury concentrations>0.5 milligrams/kilogram. (Klein)
W76-00871

IN VITRO INHIBITION OF FISH BRAIN ATPASE ACTIVITY BY CYCLODIENE INSECTICIDES AND RELATED COMPOUNDS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W76-00874

TRACE METAL LEVELS IN BEACH DIPTERANS AND AMPHIPODS,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
J. A. Bender.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 2, p 187-192, August 1975, 4 fig, 9 ref.

Descriptors: *Amphipoda, *Diptera, *Insects, *Metals, Heavy metals, Beaches, Copper, Cadmium, Iron, Zinc, Analytical techniques, Ecosystems, Nickel, Managanese, *Trace elements, Pollutant identification, *California.
Identifiers: *Beach flies, *Beach hoppers, Silver, Bioaccumulation, Coelopa vanduzeei, Fucellia rufitibia, Orchestoidea corniculata, Orchestoidea californiana, Monterey Peninsula(Cal).

Beach hoppers and flies were collected from four points on the Monterey Peninsula, California. The beach flies (Coelopa vanduzeei, Fucellia rufitibia) showed higher levels of Zn, Fe, Cu and Cd than did amphipods (Orchestoidea corniculata, O. californiana). Variations in trace metal levels on one beach over time were plotted. Great Fe flucutuations occurred while manganese, Cd, Ag and Ni showed stable levels. Cu, Pb and Zn showed moderate fluctuations. Differences in feeding habits, absorption, and metabolism between the dipterans and amphipods were discussed with reference to the variations in the metal levels. (Klein)
W76-00877

MERCURY LEVELS IN GEORGIA OTTER, MINK, AND FRESHWATER FISH,
Duke Power Co., Charlotte, N.C. Design Engineering Dept.
P. M. Cumbie.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 2, p 193-196, August 1975, 2 tab, 10 ref.

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Descriptors: *Heavy metals, *Toxicity, *Mercury, Fish, *Bass, *Suckers, *Mink, *Otters, Path of pollutants, Environmental effects, Food chains, Fish physiology, Animal physiology, Ecosystems, Pollutant identification, *Georgia, Lethal limit.
Identifiers: *Gar, *Largemouth Bass, *Chain pickerel, *Bowfin, Bioaccumulation, *Chubsucker, *Redfin pickerel, Lutra canadensis, Micropterus salmoides, Esoxniger, Amia calva, Lepisosteus, Esox americanus, Tissue analysis, *Swannee River(Geo).

The presence of mercury in fish of relatively unpolluted Georgia lower Coastal Plain streams resulted in accumulation of mercury by otter (Lutra canadensis) and mink (Mustela vison) which feed on these fish. Mercury concentrations detected in axial muscles of the fish-largemouth bass (Micropterus salmoides), chain pickerel (Esox niger), bowfin (Amia calva), gar (Lepisosteus), chubsucker (Erimyzon obloengus) and Redfin pickerel (Esox americanus), ranged from 0.12-1.40 ppm. The effects of sublethal mercury concentrations on food chains and ecosystems were discussed. (Klein)
W76-00878

IN SITU COLOUR MEASUREMENTS ON THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington(Ontario).
K. P. B. Thomson, and J. Jerome.
Environment Canada, Scientific Series No. 51, 1975. 11 p, 3 fig, 5 tab, 10 ref.

Descriptors: *Color, *Great Lakes, *Analytical techniques, *Optical properties, *Physical properties, Light, Water analysis, Water pollution effects, Water quality, Lake Ontario, Lake Superior, Surface waters, Suspended solids, Turbidity, Suspension, Productivity, Biology, Plant growth, Measurement, On-site investigations, On-site tests, Lakes, Limnology, Sediment load, Algae.
Identifiers: *Color measurements, *Spectral irradiance, *Optical measurements, Biological activity, Tristimulus values, Luminosity, Quanta spectrometer.

Measurements of upwelling and downwelling spectral irradiance have been used to compute in situ color for Lakes Ontario and Superior. The computations of the color were based on the CIE chromaticity system. Tristimulus values for a network of stations and a number of different time periods were analyzed with reference to limnological parameters. The analysis showed that suspended inorganic material and biological activity affect the in situ color in characteristic ways. In effect, three principal water regimes can be identified by their characteristic or dominant wavelength. These are clear water with little dissolved or suspended substances, water that is biologically productive, and water with heavy sediment loading. The in situ color also indicates basic differences between the two lakes that are related to their productivity. (Henley-ISWS)
W76-00885

SUMMARY OF GROUND WATER QUALITY IN THE LOS ANGELES DRAINAGE PROVINCE,
California Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 7C.
W76-00888

DILUTION AND DECAY OF AQUATIC HERBICIDES IN FLOWING CHANNELS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W76-00895

PRECIPITATION: ITS ACIDIC NATURE,
Pittsburg Univ., Pa. Dept. of Occupational Health.
For primary bibliographic entry see Field 2K
W76-00900

IN SITU SOIL GAMMA ANALYZER--A NEW APPROACH TO DETERMINE THE MOVEMENT OF POLLUTANTS IN SOILS.
National Environmental Research Center, Las Vegas, Nev.
J. C. McFarlane, K. W. Brown, and R. R. Kinnison
Soil Science, Vol. 120, No. 2, p 140-146, August 1975. 4 fig, 4 ref, 1 append.

Descriptors: *Pollutant identification, *Nuclear meters, *On-site investigations, *Radioactivity, *Soil contamination, Soils, Soil analysis, Evaluation, Soil tests, Instrumentation, Gamma rays, Radiation, Analytical techniques, Radioactivity techniques, Soil chemistry, Trace elements, Path of pollutants, Radioisotopes
Identifiers: *Soil gamma analyzer, *Gamma analyzer, *On-site analyzer, Automatic analysis, Gamma-emitting material.

The in situ soil gamma analyzer is an instrument constructed to measure the position of gamma-emitting trace elements in soil. It consists of a solid state scintillator, a lead shield with a 3-mm-wide horizontal window, and a portable analyzer. When the detector is lowered into a circular excavation dug vertically into the soil of interest, the gamma activity of the tracer is plotted as a function of depth thus yielding a profile of the tracer distribution. Because of a broad base profile in the original plotted data, which is due to soil attenuation and the lack of collimation, a computer program was written to replot the distribution pattern to within + or -1 mm of actual position. By making a series of time-related measurements, the rate of pollutant movement in soil is obtained. (Henley - ISWS)
W76-00912

ODOR INTENSITIES AT CATTLE FEEDLOTS,
Texas Agricultural Extension Service, College Station.
J. M. Sweeten, D. L. Reddell, L. M. Schake, and B. Garner.
Presented at the 1st Annual Symposium on Air Pollution Control in the Southwest, Texas A and M University, College Station, Texas, November 5-7, 1973, 17 p. 3 fig, 7 tab, 29 ref.

Descriptors: *Odor, *Feed lots, *Cattle, Air pollution, Runoff, Farm wastes, Measurement, Weather data, Moisture, Settling basins.
Identifiers: *Scentometer, *Calcium bentonite, Odor intensity index.

Odor intensities measured at two cattle feedlots in Texas, ranged from 2 to 170 dilutions to threshold (DT) which nearly covered the measurement range of the scentometer. The average odor reading for the surface of a 4000 head feedlot, determined by monitoring four randomly selected pens for 7 months, was 30.7 DT. The runoff settling basin and retention pond averaged 68 and 47 DT, respectively. Half of the odor intensities were more than 23 DT (which exceeds the odor standards in several states). At a 12,000 head feedlot, trials using calcium bentonite as a ration supplement (at 0.0, 0.8, and 2.0% levels) showed a reduction in odors from the 2% bentonite treatment. Bentonite also improved average daily gain of cattle during the first 21 days. The scentometer was found to be a useful, if somewhat imprecise, diagnostic tool for identifying the primary sources of odors within a cattle feedlot. (Russell-East Central)
W76-00919

NUCLEAR SHIP POLLUTION: NATIONAL AND INTERNATIONAL REGULATION AND LIABILITY,
For primary bibliographic entry see Field 6E.
W76-00921

UNION OIL CO. V OPPEN: RECOVERY OF PURELY ECONOMIC LOSS IN NEGLIGENCE (NOTE ON CASE ARISING FROM OIL SPILL),
For primary bibliographic entry see Field 6I.
W76-00924

5B. Sources Of Pollution

THE EFFECTS OF STREAM CHANNELIZATION OF THE DISTRIBUTION OF NITRIENTS AND METALS,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
C. W. O'Rear, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 193, $4.25 in paper copy, $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleighs. UNC WRRI Report No. 108, August 1975. 52 p, 14 fig, 31 tab, 29 ref, append. OWRT A-080-NC (3), 14-31-0001-4033.

Descriptors: *Channel Improvement, *Nutrients, Phosphorus, Nitrogen, Swamps, Chemical analysis, Chemical precipitation, *Metals, Aquatic plants, Water temperature, Oxygen, Sediment, *Water quality, *North Carolina, *Path of pollutants, *Distribution patterns, Dissolved solids, Dissolved oxygen.
Identifiers: *Channelization, Swift Creek(NC), Nutrient concentrations, Chicod Creek(NC), Ammonia-nitrogen.

The project was designed to determine the distribution patterns of nutrients and metals in channelized and unchannelized stream segments and to determine if modifications occur in the distribution of nutrients. Adjacent segments of Swift Creek, Pitt County, North Carolina were used as the sites. An upstream segment channelized in 1937 was used as a representative natural stream while a segment approximately one kilometer downstream, channelized in 1965, was used as a representative channelized stream. Sampling was performed from September, 1973, through November, 1974. Water temperature in the natural segment tended to be lower than in the channelized segment due to a greater canopy cover in the natural segment. Dissolved oxygen in the channelized segment was consistently higher during low flow periods with average differences exceeding 2 mg/l. Most of the nitrogen and phosphorus moved through both stream segments during the high flow periods. The highest concentrations were observed during the low flow period of October through December. Ammonia-N accounted for most of the increased nitrogen concentrations while particulate phosphorus accounted for the rise in total phosphorus. Nutrient concentrations in Chicod Creek were lower than the unchannelized segment of Swift Creek. Modification of the nutrient distribution patterns could not be directly determined from the measured nutrient concentrations and flows. Dissolved metal concentrations between the two segments showed no significant differences. (Stewart-North Carolina State)
W76-00501

IMPACT OF FREEZING AND THAWING SOIL CONDITIONS ON THE MOVEMENT OF NUTRIENTS FROM RURAL LANDS,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
G. D. Bubenzer, and J. C. Converse.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 190, $3.75 in paper copy, $2.24 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, September 1975. 43 p, 16 tab, 6 fig, 23 ref. OWRT B-076-WIS (3), 14-31-0001-3946.

Descriptors: *Farm wastes, *Agricultural runoff, *Soil contamination, *Ammonia, *Nitrogen, *Water pollution, *Water quality, *Experimental models, Movement, *Wisconsin, *Path of pollutants.

nodel was developed to predict transformations l vertical movement of manurial nitrogen ough unsaturated soil profiles following early ing manure application. Processes treated in the del include water movement in unsaturated l, nitrate dispersion due to mass flow and the rogen transformations of mineralization and rification. Output from the model includes the tical nitrate distribution in the soil and the ount of nitrate leaching from the soil profiles. e pollution potential of snowmelt from areas ead with manure was investigated. Urinal and al wastes were placed in runoff boxes at the e, midpoint and top of 20cm snow packs. The ts were subjected to carefully controlled tem- rature fluctuations ranging from 8 to 12 degrees Urinal losses were determined primarily by the antity of water which passed through the nure layer. Fecal nitrogen losses were much ver than urinal losses. Freezing and thawing ac- ns were important factors which influenced the al nitrogen losses. Runoff and nutrient losses m ten alfalfa plots were monitored for a 3-year riod. Dairy cattle manure was applied in the fall, nter and spring at the rate of 2.25 g/square mile et weight basis). Annual precipitation for the 3- ar period ranged from 105.4 to 108.3 cm with ap- oximately 12% (Water equivalent) in the form of ow. The average annual runoff from the check, l, winter and spring applied manure plots was 6, 7.3, 10.4 and 10.6 cm, respectively. No sig- icant differences were observed in the nutrient sses from the various treatments.
76-00502

RECASTS OF THE EFFECTS OF AIR AND ATER POLLUTION CONTROLS ON SOLID ASTE GENERATION.
one (Ralph) and Co., Inc., Los Angeles, Calif.
r primary bibliographic entry see Field 5D.
76-00510

ENTIFICATION OF OBJECTIONABLE EN- RONMENTAL CONDITIONS AND ISSUES SSOCIATED WITH CONFINED DISPOSAL REAS,
ttle (Arthur D.), Inc., Cambridge, Mass.
E. Harrison, and L. C. Chisholm.
vailable from the National Technical Informa- n Service, Springfield, Va 22161, as AD/A-000 5, $7.25 in paper copy, $2.25 in microfiche. rmy Waterways Experiment Station, Vicksburg, ississippi, Environmental Effects Laboratory. ptember, 1974. 134 p, 24 fig, 15 tab, 108 ref, 3 pend.

escriptors: *Waste disposal, *Environmental ef- cts, Land use, Land management, On-site in- stigations, Public rights, Dikes, Wetlands.
entifiers: Land application, Dredged material.

ur on-site investigations at the United States rmy Engineering District areas of Mobile, Port- nd, Norfolk, and Detroit were conducted to udy objectionable conditions associated with nfined disposal of dredged material. Problems volve: conditions associated with disposal area effectiveness, such as dike failures; conditions sociated with biological, chemical, or physical anges caused by the disposal area; and issues as- ciated with site selection such as ecological ef- cts and changes in land management and use. blic attitudes toward confined disposal appear be related to past experiences. Current chnology is able to deal with the prevention of ke failure, seepage, channelization, and dike osion, but is not able to solve the problem of anding water in disposal areas. Ecological issues ve been centered upon the wetlands as disposal tes and the ultimate use and control of such eas. It was suggested that alternative disposal ocedures be implemented, asuch as pumping in- nd, to avoid disruption of ecologically-sensitive etland areas. (Kramer-FIRL)
76-00516

GROUND WATER POLLUTION FROM SUB-SURFACE EXCAVATIONS: PART V, OTHER TYPES OF WELLS.
Environmental Protection Agency, Washington, D.C.
Water Well Journal, Vol 28, No 8, p 59-62, August, 1974.

Descriptors: *Water pollution, *Well, Disposal wells, Sewage disposal, Desalination, Underground storage, Geothermal studies, Regulation, Excavation.
Identifiers: Prevention.

Other wells include types used in conjunction with oil exploration and production, solution mining, geothermal energy production, sewage treatment, desalinization, radioactive waste disposal, underground gas storage and water exploration and production. Many of the technical and regulatory aspects previously described in part IV of this study apply to these wells. (See also W74-09929) The differences are discussed. For example, gas storage wells present a potential for contamination of ground water by leakage of gas through the confining beds, through abandoned improperly plugged wells, or through inadequately constructed gas injection or withdrawal wells. Gas could also escape from an overpressured field and migrate laterally in the storage aquifer. (Bradbeer-NWWA)
W76-00525

GROUND WATER POLLUTION FROM SUB-SURFACE EXCAVATIONS. PART IX, LAND-FILLS.
Environmental Protection Agency, Washington, D.C.
Water Well Journal, Vol 28, No 12, p 41-44, December, 1974.

Descriptors: *Landfills, *Water pollution sources, Garbage dumps,, Public health, Solid wastes, Leaching, Subsurface drainage, Soil contamination, Monitoring, Waste disposal, Excavation.
Identifiers: Pollution monitoring.

A sanitary landfill is: 'A method of disposal of refuse on land without creating nuisances or hazards to public health or safety, by utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth at the conclusion of each day's operation or at such more frequent intervals as it may be necessary.' Less than 10 percent of the refuse disposal sites in the United States are operated within the accepted definition of a sanitary landfill. The potential hazard of landfills to ground water quality via leachate is a function of the total amount of waste generated, its areal distribution, the composition of the waste itself, and the siting, design, and operation of the fill. Leaching of landfills depends upon a source of water moving through the fill. Possible sources include precipitation, moisture content of the refuse, and ground water in contact with the fill. Effects of climate on leachate are discussed. A long list of control measures is given. These are in general those which exclude water from the landfill, prevent leachate from percolating to ground water, or collect leachate and subject it to biological treatment. Monitoring procedures are suggested including sampling wells around the site. (Bradbeer-NWWA)
W76-00526

GROUND WATER POLLUTION FROM SUB-SURFACE EXCAVATIONS, PART X, SEWER LEAKAGE.
Environmental Protection Agency, Washington, D.C.
Water Well Journal, Vol 24, No 1, p 92-95, January, 1975.

Descriptors: *Sewers, *Water pollution, Drainage systems, Subsurface drainage, Water quality control, Leakage, Design, Monitoring, Maintenance, Excavation.
Identifiers: *Influent, Pollution monitoring.

Gravity sewers above the ground water table, and pressure outfalls either above or below it, are common elements of the domestic sewerage system of organized communities. Seasonally, storm sewers involving underground conduits and lined and unlined open channels carry runoff from paved and unpaved land surfaces. A sewer is intended to be water-tight and thus to present no hazard to ground water except when temporarily disrupted by accident. Leakage is in reality a common occurrence, especially from older sewers. Leakage in gravity sewers may result from poor workmanship, cracked or defective pipe sections, breakage of pipe and joining material by tree roots, displacement of pipeline by superimposed heavy loads, rupture due to landslide activity or seismic activity, loss of support due to underground washout, differential settlement, and storm water infiltration surcharging the system causing sewage to back up. Sewer leakage will be less of a hazard to ground water in the future than at present, even though the extent of the systems is certain to increase to accommodate growth. The principal reasons are improved construction and maintenance practices. Control methods include a public policy of maximum concern for water quality protection, organized and identified responsibility for sewer construction and maintenance, a program of inspection at five year intervals, emphasis on personnel training, and exclusion from discharge to public systems of irretrievably hazardous materials. (Bradbeer-NWWA)
W76-00527

GROUNDWATER POLLUTION FROM SUB-SURFACE EXCAVATIONS, PART XI, TANK AND PIPELINE LEAKAGE.
Environmental Protection Agency, Washington, D.C.
Water Well Journal, Vol 24, No 2, p 37-41, February, 1975.

Descriptors: *Water pollution, *Groundwater, *Detection, *Control, *Monitoring, *Path of pollutants, Pipelines, Underground, Storage tanks, Radioactive wastes, Petroleum, Excavation.
Identifiers: Tanks, Underground pipeline.

The nature and occurrence of tank and pipeline leakage are described and practices that have been found effective in the control and abatement of ground water pollution are summarized. Emphasis is on petroleum products because they constitute the majority of materials stored or transmitted in subsurface excavation. Leakage of these may be more pervasive than generally realized. This is particularly true for a small installation where installation, inspection, and maintenance standards may be low. The major cause of leakage is corrosion, which attacks both externally and internally. The second greatest cause can be found by aggregating those related to pipeline component, equipment, personnel failure or malfunction. The third greatest cause is line rupture as the result of accidents caused by earth moving equipment. The remaining causes include vandalism, severe weather, lightning. floods, earthquakes and forest fires. Pollution movement is traced. Control methods include leak prevention by protection against corrosion and structural design, containment of leaks (Almost exclusively applied to tanks), or automatic shut-off valves and abatement by removal of soil, by pumping or ditching, by biodegradation, and by chemical action. Monitoring procedures have been developed and implemented by interstate carriers, but may be applied to any underground tank or pipeline. Regular checking of pipeline and tanks is accomplished by throughput monitoring, periodic inspection, and periodic pressure testing. (Bradbeer-NWWA)
W76-00528

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FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,
Massachusetts Inst. of Tech., Cambridge. Dept of Civil Engineering; and Massachusets Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
F. M. M. Morel, J. C. Westall, C. R. O'Melia, and J. J. Morgan.
Environmental Science and Technology, Vol 9, No 8, p 757-761, August 1975. 4 fig, 3 tab, 14 ref.

Descriptors: *Trace elements, *Waste dilution, *Metals, *Sewage effluents, *Waste disposal, *Water chemistry, *California, Water analysis, Chemical properties, Disposal, Drainage water, Chemistry, Domestic wastes, Industrial wastes, Outfall sewers, Inorganic compounds, Sewage treatment, Water pollution sources, Water pollution, Sea water, Estuarine environment, Pollutants, Sediments, Equilibrium, Model studies, Speciation, Heavy metals.
Identifiers: *Los Angeles County(Calif).

A chemical equilibrium model of Los Angeles County sewage outfall was presented which accounts for the chemical speciation of trace metals. Many metals were found in very insoluble sulfide (Zn, Hg, Ag, Cu, Cd, Pb) or oxide (Cr, Fe) forms, while some (Ni, Co, Mn) were relatively soluble. A study of the oxidation and dilution of the sewage by seawater demonstrated that most metals tend to be solubilized upon disposal in the ocean and that unmeasurable increments in the natural metal concentrations should result away from the outfall. It was argued that the sewage particulate is not mobilized in the vicinity of the outfall and that the nearby sediments are a mixture of naturally-occurring sediments and sewage particulate. About 0.5% of the sewage particulate--and its metal content--can be accounted for in the reduced area. (Henley-ISWS)
W76-00545

THE USE OF A PELAGIC TROPHODYNAMIC CHAIN FOR STUDYING THE TRANSFER OF METALLIC POLLUTANTS, (IN FRENCH),
Centre dEtudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, R. Bittel, F. Laumond, M. Romeo, and B. Donnier.
Rev Int Oceanogr Med. 283 p 27-52, 1972. Illus. (Engl. summ.).

Descriptors: *Seawater, Source of pollutants, Metals, *Pollutants, *Heavy metals, Copper, Zinc, Chromium, Lead, Mercury, *Water pollution.
Identifiers: Pelagic trophodynamic food chain.

Discharges of metallic products in a simple or complexed form into seawater become more and more important. It is necessary to assess the hazards of contamination for man by consumption of marine products. The use of marine food chains permits 'in vitro study of these concentration phenomena. The factors of transfer of different metals may be measured at each level of the pelagic food chain. The transfer of 5 heavy metals Cu, Zn, Cr, Pb and Hg was studied in an ionic or complexed form.--Copyright 1974, Biological Abstracts, Inc.
W76-00577

A PROBLEM IN THE USE OF INSECTICIDES IN PADDY FIELDS IN WEST MALAYSIA: A CASE STUDY,
Ministry of Agriculture and Lands, Kuala Lumpur (Malaysia). Div. of Agriculture.
Ahmad Yunus, and Lim Guan Soon.
Malays Agric J. Vol 48, No 2: p 167-183. 1971 Illus.

Descriptors: *Insecticides, Water pollution, *Fish toxins, Fish, *Water pollution sources, *Water pollution effects, Dieldrin, Endrin.
Identifiers: Azinophos, BHC, Carbaryl, Endosulfan, Ethyl, Fenitrothion, Fenthion, Malathion, Malaysia, Paddy fields.

A field survey to determine the problem of fish toxicity arising from the use of insecticides in paddy fields was carried out in 2 of the major paddy growing areas, Province Wellesley in the State of Penang and Krian District in the State of Perak in Jan- Apr., 1970. Ninety percent of the farmers used insecticides to control insect pests on their crops. Insecticides commonly used were endosulfan, carbaryl and BHC. In general, spot application was more popularly practices than blanket and prophylatic treatments. Hence the quantity of insecticide used per crop was relatively small. Among the above chemicals, only endosulfan caused acute toxicity to paddy field fishes. However, killing of the fishes by BHC, azinophos-ethyl, dieldrin and endrin was observed in Krian, due to the higher rates of application employed. No fish mortality was observed in the connecting ponds and irrigation canals adjacent to paddy fields. Paddy field fishes provided additional income to 35% of the farmers surveyed. Apart from the income, the fishes also served as the main daily source of protein in their food. The use of endosulfan which is effective in controlling stem borers, should be avoided in areas where fishes are considered important and BHC (applied at not more than 2 lb. a. i./acre) could be used in its place. Insecticides such as dieldrin, endrin and azinophos-ethyl which show strong piscicidal effect should also be avoided in such areas. The use of malathion, carbaryl, fenitrothion and fenthion can be continued. There is a need to extend the survey to other paddy growing areas.--Copyright (c) 1974, Biological Abstracts, Inc.
W76-00581

PREDICTION OF ASSIMILATION CAPACITY IN RECEIVING STREAMS, PART I,
Oklahoma State Univ., Stillwater. Dept. of Civil Engineering.
A. F. Gaudy, Jr.
Water and Sewage Works, Vol 122, No 5, p 62-65, May, 1975. 3 fig.

Descriptors: *Waste assimilative capacity, *Dissolved oxygen, Biochemical oxygen demand, Oxygen sag, Oxygenation, Waste water disposal, Analytical techniques, Rivers, Measurement, *Forecasting.

The practical method described for predicting the dissolved oxygen profile has been used for studying the assimilation capacity of a portion of the Red River in Oklahoma. This method overcomes some of the problems associated with the use of the Streeter-Phelps say equation which have led to a lack of accurate prediction. The Streeter and Phelps concept states that the dissolved oxygen profile is the result of deoxygenation due to introduction of organic pollutants, and reoxygenation due to mass transfer of oxygen from the atmosphere. The integrated form of a mathematical expression of this concept is known as the 'sag equation'. A better expression for the sag equation would be to describe it as a function of reaeration minus oxygen uptake. A rationale for this description is presented. The only BOD curve that can be expected to hold true for the receiving stream situation is one obtained by using the same dilution as that expected in the receiving stream. This is not always possible using the normal closed bottle BOD dilution technique. A stirred open jar reactor system is proposed as an improved practical method for estimating BOD curves rather than the standard closed bottle technique. The first step is to add the effluent and the receiving stream water in the desired proportion and aerate the system to bring the DO level close to the saturation concentration. A portion of acclimated seed is then added to the river water. After initiating the experiment, the dissolved oxygen profile is determined electrometrically. (See also W76-00601) (Orr-FIRL)
W76-00600

PREDICTION OF ASSIMILATION CAPACI IN REC EIVING STREAMS, PART II,
Oklahoma State Univ., Stillwater. Dept. of C Engineering.
A. F. Gaudy, Jr.
Water and Sewage Works, Vol 122, No 6, p 78 June, 1975. 2 tab, 17 ref.

Descriptors: *Waste assimilative capaci *Forecasting, *Dissolved oxygen, Streams, O ygen demand, Biochemical oxygen deman Analytical techniques, Waste water disposal Identifiers: Effluent discharges, Oxygen upta curve.

A procedure for predicting the dissolved oxyg profile from the calculated oxygen uptake curve streams receiving effluent discharges is outlin The procedure has been used to determine the similation capacity of part of the Red River Oklahoma. The dissolved oxygen saturation val and the reaeration constant K2 are calculate deficit is computed, multiplied by the K2 valu and recorded. The time interval and the avera values during the time interval are taken. Fro this, the change in dissolved oxygen (DO) conce tration may be computed as the oxygen upta during a particular interval. By repeated calcul tions, a representative average accumulated o ygen uptake curve (BOD curve) may be made f the effluent-river water mixture. From this curv the dissolved oxygen profile may be computed. this case, oxygen uptake for BOD values was re off at even hour intervals. After accounting for t amount of deficit from saturation, the amount oxygen added during each time interval was o tained by multiplying the reaeration constant (K by the deficit value and delta time. Calculatio are easily computer programmed. In many recei ing stream situations, K2 does not remain consta and must be adjusted for each successiv downstream reach. For open jar reacto techniques, it is suggested that preliminary an training runs be used. While this method is st under investigation, it has been successfully use to make an engineering prediction of the impact o an effluent on the DO of a resource. (See als W76-00600) (Kramer-FIRL)
W76-00601

GAS CHROMATOGRAPHIC (ECD DETERIMINATION OF COPROSTANOL AN CHOLESTEROL AS INDICATORS OF FECA POLLUTION IN WATER, (IN JAPANESE),
Ehime Univ., Matsuyama (Japan). Dept. o Chemistry.
For primary bibliographic entry see Field 5A.
W76-00602

NEW ORLEANS DRINKING WATER SOURCES TESTED BY GAS CHROMATOGRAPHY MASS SPECTROMETRY, OCCURRENCE AN ORIGIN OF AROMATICS AN HALOGENATED ALIPHATIC HYDROCAR BONS,
New Orleans Univ., La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W76-00603

CHEMICAL COMPOSITION OF ORGANIC COMPOUNDS PRESENT IN WATER OF THE TAMAGAWA RIVER, (IN JAPANESE),
For primary bibliographic entry see Field 5A.
W76-00606

DEVELOPMENT OF A GROSS POLLUTION DETECTOR: LABORATORY STUDIES,
Severn-Trent Water Authority, (England).
For primary bibliographic entry see Field 5A.
W76-00609

EVELOPMENT OF A GROSS POLLUTION ETECTOR: FIELD TRIALS,
vern-Trent Water Authority, (England).
or primary bibliographic entry see Field 5A.
76-00610

RGANIC RESIDUE IN RECYCLED EF-LUENT, PART II,
ah State Univ. Logan.
or primary bibliographic entry see Field 5D.
76-00646

ROUND-WATER QUALITY BENEATH OLID-WASTE DISPOSAL SITES AT NCHORAGE, ALASKA,
eological Survey, Anchorage, Alaska.
Zenone, D. E. Donaldson, and J. J. Grunwaldt.
pen-file report, 1974. 23 p, 8 fig, 2 tab, 9 ref.

escriptors: *Landfills, *Alaska, *Water pollution urces, *Path of pollutants, Leachate, Groundater movement, Hydrogeology, Water table, ater quality, Waste disposal, Garbage dumps, olid wastes.
entifiers: *Anchorage(Alaska).

t three solid-waste disposal sites in the nchorage area of Alaska, differences in local eohydrologic conditions influence groundwater ality. Leachate was detected in groundwater ithin and beneath two sites where the water table very near land surface and refuse is deposited ther at or below the water table in some parts of e filled areas. No leachate was detected in oundwater beneath a third site where waste sposal is well above the local water table. Woodard-USGS)
76-00656

ISCOVERY OF THE GASTROPOD SNAIL ELANOIDES (THIARA) TUBERCULATA MULLER) IN FLORIDA,
eological Survey, Miami, Fla.
N. Russo.
lorida Scientist, Quarterly Journal of the Florida cademy of Sciences, Vol 36, No 2-4, p 212-213, 973. 1 tab. 5 ref.

escriptors: *Water pollution sources, *Snails, Florida, Surface waters, Public health, Human seases, Toxicity, Gastropods, Parasitism, Animal parasites.
dentifiers: *Melanoides tuberculata.

he first known colonies of the oriental snail Melanoides tuberculta were collected in South lorida in 1971. The snails were found in both esh and brackish canal waters. Melanoides is so known to be an intermediate host of a human arasite Philohthalmus sp. Both the snail and the araside are prevalent in the Orient and have been eported in San Antonio, Texas. The potential for uman infestation does exist in Florida with the resence of the intermediate host but is probable nlikely. (Woodard-USGS)
76-00660

ISTRIBUTION OF RADIONUCLIDES IN THE OLUMBIA RIVER STREAMBED, HANFORD ESERVATION TO LONGVIEW, WASHING-ON,
eological Survey, Reston, Va.
. L. Haushild, G. R. Dempster, Jr., and H. H. tevens, Jr.
vailable from Supt of Docuements, GPO, Wash, C, 20402, price $1.20. Professional Paper 433-O, 975. 35 p, 12 fig, 11 tab, 21 ref.

escriptors: *Path of pollutants, *Nuclear wastes, Columbia River, *Washington, *Nuclear reacors, Carriers, Radiosotopes, Sediments, Sediment transport, Particle size, Distribution patterns, Streambeds, Bottom sediments, Streamow, Data collections.
dentifiers: *Hanford Reservation(Wash).

Until all the eight reactors at Hanford Reservation, Washington, cooled by once-through flow of treated Columbia River water, were shut down in 1971, their cooling-water effluent was the main source of dissolved and particulate radionuclides in the Columbia River. The distribution and quantities of radionuclides accumulated in the riverbed were investigated. Chromium-51 and scandium-46 usually had a greater affinity for fixation to fine sediment, relative to coarse sediment, than did zinc-65 or cobalt-60. Radionuclide concentrations in both coarse sediment and fine sediment did not vary significantly (95 percent confidence level) within relatively long river reaches. In June 1965, 28,900 curies of radionuclides were estimated to be in the Columbia River streambed from the reactors to the ocean: 20,200 curies in the riverbed, and 8,700 curies in the estuary bed (Hubbell and Glen, 1973). A predominance of chromium-51 over zinc-65 in the estuary bed and an opposite predominance in the riverbed indicate less seasonal variation in the accumulation of radionuclides (epecially chromium-51) in the estuary bed than in the riverbed. (Woodard-USGS)
W76-00664

FLOW ESTABLISHMENT AND INITIAL ENTRAINMENT OF HEATED WATER SURFACE JETS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
H. Stefan, L. Bergstedt, and E. Mrosla.
Available from the National Technical Information Service Springfield, Va 22161 as PB-243-744. Environmental Protection Agency Report EPA-660/3-75-014, May 1975. 141 p, 36 fig, 5 tab, 15 ref, 2 append. R-800-435.

Descriptors: *Mathematical models, Outlets, Flow rates, *Thermal pollution, Discharge(Water), Water quality, Water quality control, Water pollution, Water pollution control, Experimental data, Flow, Mixing zone, Dilution, Heated water, *Jets, Path of pollutants.
Identifiers: *Thermal plumes, Surface discharge, Heated water jet, Jet flow, Buoyant jets, Zone of flow.

Mathematical modeling of the zone of flow (re-)establishment (ZFE) of heated water surface jets has been found to be difficult because of the complex dependence on outlet geomtry, discharge velocity, buoyancy, and ambient currents. Laboratory experiments have therefore been conducted to provide more observations and data on flow patterns, temperatures, and flow velocities in the ZFE and some distance beyond. From this information, relationships giving the length of the ZFE, the volumetric flow rates versus distance, and the initial spreading angle have been derived. The independent variables were outlet aspect ratio, outlet densimetric Froude number, and cross-flow ratio. The relationships provided can be used to make more accurate temperature predictions in the immediate vicinity of a heated water surface channel. (EPA)
W76-00679

URBAN STORMWATER MANAGEMENT MODELING AND DECISION-MAKING,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W76-00695

CONTRIBUTIONS OF URBAN ROADWAY USAGE TO WATER POLLUTION,
Biospherics Inc., Rockville, Md.
D. G. Shaheen.
Available from the National Technical Information Service Springfield, Va 22161. Environmental Protection Agency, Report EPA-600/2-75-004, March 1975. 346 p, 20 fig, 28 tab, 17 ref, 10 append. 1BB034 Roap/Task 21 ASY 05. EPA 68-01-0197.

Descriptors: *Water pollution sources, *Storm runoff, Surface runoff, *Urban runoff, Nutrients, *Heavy metals, *Asbestos, *Rubber, Solid wastes, District of Columbia, Roads.
Identifiers: Inorganic wastes, *Street surface contaminants, Grease, Washington, D. C.

Street surface contaminants are deposited on roadways from many sources within an urban area. Industrial operations, land use activities, fallout of air pollutants, roadway usage and other activities contribute to the loading of particulates on urban roadways. These materials are then carried into receiving waters by storm runoff where they constitute a substantial portion of the overall water pollution problems of cities. Metropolitan Washington, D.C., with its low background of industrial emissions, was the area chosen for study of contributions of motor vehicle usage to urban roadway loading factors. Specific roadway study sites within this area were selected so as to provide minimal interference from nontraffic-related land use activities and thus isolate, as much as possible, the traffic-related depositions. Motor vehicular traffic is directly or indirectly responsible for deposition of substantial quantities of materials on roadways in urban areas. Significant levels of toxic heavy metals and asbestos and slowly biodegradable petroleum products and rubber are deposited directly from motor vehicle along with large quantities of particulate materials contributed indirectly by traffic. The particulates contribute indirectly by traffic are largely inorganic, but have associated with them solids and nutrients which represent a serious source of water pollutants in all metropolitan areas. (EPA)
W76-00696

TCA IN IRRIGATION WATER AFTER BANK TREATMENTS FOR WEED CONTROL,
Agricultural Research Service, Prosser, Wash. Irrigated Agriculture Research and Extension Center.
R. D. Comes, P. A. Frank, and R. J. Demint
Weed Science, Vol 23, No 3, p 207-210, May, 1975. 3 tab, 9 ref.

Descriptors: *Herbicides, *Weed control, *Irrigation water, *Water pollution, Plant growth regulators, Irrigation ditches, Embankments, Irrigated land, Bank protection, Water pollution sources, Defoliants, Agricultural chemicals, Water analysis, Water quality, Chemical analysis, Irrigation, *Pollutant identification.
Identifiers: *Trichloroacetic acid(TCA).

Concentrations of trichloroacetic acid (TCA) were determined in irrigation water after the herbicide had been applied to the banks of dry canals at 82 kilograms/hectare for weed control. When the canals were refilled about 5 months after treatment, maximum concentrations of TCA detected in the water ranged from 53 to 297 parts per billion (ppb). The concentration was highest during the first hour of water flow with maximum concentration increasing at a rate of 26 to 30 ppb/kilometer of treated canal flow, unless surface runoff or reduced flow volumes caused abnormal canal flows. With one exception, no TCA was detected in the water after 4 hours of flow. In the 6 experiments conducted, the highest average concentration of TCA during the first 240 minutes of water flow was 50 ppb. Calculations show that only 2.4 cm of water could be applied in the initial 240 minute period and that if the highest average concentration were used as a base value, only 12g of TCA would be applied by the water to 1 hectare of cropland. (Robinett-Arizona)
W76-00706

FIELD STUDY OF SOLUTE MOVEMENT IN A HIGHLY AGGREGATED OXISOL WITH INTERMITTENT FLOODING: II. PICLORAM,
Hawaii Univ., Honolulu, Dept. of Agronomy and Soil Science.
P. S. C. Rao, R. E. Green, V. Balasubramanian, and Y. Kanehiro.

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Journal of Environmental Quality, Vol 3, No 3, p 197-202, July-September, 1974. 2 fig, 1 tab, 16 ref.

Descriptors: *Pesticides, *Herbicides, Soil chemistry, Water quality, Groundwater, Irrigation, Soil profiles, *Path of pollutants, Water pollution sources.
Identifiers: *Picloram.

Most of the applied herbicide picloram was retained in the top 40-cm depth of the Molokai soil with cumulative applications of 48 to 74 cm water following application of the chemical to the soil surface. Although movement of the picloram peak was retarded more than was anticipated from equilibrium adsorption measurements, a significant fraction of the applied herbicide moved ahead of the peak deep into the profile (down to the 143-cm depth) after a single application of 24-cm water. Rapid flow through macropore sequences combined with temporary retention of picloram in aggregate micropores appear to be responsible for the unusual pattern of movement. Published data for nitrate movement in the same field plots of Molokai soil were compared with picloram movement data to provide a measure of the relative mobility of these solutes. A comparison of the results reported here with published field data of solute leaching in other soils indicated a greater retardation of solute peak movement in Molokai soil than in less aggregated soils. (Skogerboe-Colorado State)
W76-00718

DIFFERING SENSITIVITY OF CORN AND SOYBEAN PHOTOSYNTHESIS AND TRANSPIRATION TO LEAD CONTAMINATION,
Illinois Univ., at Urbana-Champaign.
F. A. Bazzaz, G. L. Rolfe, and P. Windle.
Journal of Environmental Quality, Vol 3, No 2, p 156-158, April-June, 1974. 3 fig, 15 ref.

Descriptors: *Heavy metals, *Crop response, *Lead, *Corn(Field), *Soybean, Photosystems, Transpiration.

Corn and Soybean plants grown in media containing a range of Pb concentrations supplied as PbCl (2), showed decreased net photosynthesis and transpiration with increasing Pb treatment levels. At lower Pb treatment levels, corn appears to be more sensitive than soybeans. However, at high treatment levels (62.5-250 mg/plant) soybeans are more sensitive than corn. At 250 mg Pb/plant in the medium, photosynthesis is only 10% of maximum in soybeans but 47% in corn, even though corn Pb tissue content is much higher than that of soybeans. Transpiration exhibited similar trends to photosynthesis suggesting that, especially in corn, an appreciable part of the inhibition of the two processes is related to increased stomatal resistances with increased Pb concentrations. Lead accumulation trends were similar at treatment levels of 0 to 62.5 mg/plant but were slightly different at higher levels. The total amount of Pb accumulated was higher in corn than in soybeans. Maximum accumulation in both species occurred at 62.5 mg Pb/plant. (Skogerboe-Colorado State)
W76-00720

COLUMN STUDIES OF SOIL CLOGGING IN A SLOWLY PERMEABLE SOIL AS A FUNCTION OF EFFLUENT QUALITY,
Wisconsin Univ., Madison Dept. of Soil Science.
T. C. Daniel, and J. Bouma.
Journal of Environmental Quality, Vol 3, No 4, p 321-326, October-December, 1974. 8 fig, 2 tab, 25 ref.

Descriptors: *Septic tanks, *Soil disposal fields, *Clogging, *Effluents, Chemical oxygen demand, Biochemical oxygen demand, Soil properties, Soil investigations, Soil structure, Soil water movement, Loam.

Clogging as a function of effluent quality was investigated in cores of the very slowly permeable Almena silt loam soil which offers problems for conventional on-site liquid waste disposal. Undisturbed 60 cm long cores were subjected for approximately 120 days to constant ponding with simulated septic tank effluent, extended aeration effluent and distilled water. Column influents and effluents were monitored with respect to chemical oxygen demand (COD), biochemical oxygen demand (BOD), and solid residue fractions. Column influents differed markedly in COD and BOD content but column effluents had consistently low contents indicating the high renovative capacity of the soil. In situ tensiometric, redox, and flow rate measurements indicated development of the most severe barriers to flow in columns ponded with low BOD aerated effluent, followed closely by those ponded with high BOD septic tank effluent. (Skogerboe-Colorado State)
W76-00721

PLANT NUTRIENT LOSSES FROM TILE-OUTLET TERRACES,
Iowa State Univ., Ames. Dept. of Agronomy.
J. J. Hanway, and J. M. Laflen.
Journal of Environmental Quality, Vol 3, No 4, p 351-356, October-December, 1974. 3 fig, 4 tab, 13 ref.

Descriptors: *Nutrient removal, *Nutrients, *Phosphorus, Tile drainage, Sediment, Nitrogen, Nitrification, Sulfur, Runoff, Fertilizer, Fertilization, Tile drains.

Plant nutrient losses in runoff water from four tile-outlet terrace systems in Iowa and in tile drainage from two of the systems were measured annually from April to November over a 3-year period. Soluble P concentrations in surface runoff were related to available P in the surface soils, and concentrations in tile drainage were related to available P in the subsoils. Concentrations of inorganic N varied widely among locations, but were relatively constant at a location. Average annual inorganic N concentrations in surface runoff were 4 ppm or less at three of the four sites and 11 ppm at one site. Concentrations of inorganic N and sulfate S were similar and were lower in surface runoff than in tile drainage. There was no relation between the amounts of fertilizer applied and plant nutrient losses or concentrations in runoff or drainage water. (Skogerboe-Colorado State)
W76-00723

NITRATE AND CHLORIDE LEACHING IN A SWELLING CLAY SOIL,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
D. E. Kissel, J. T. Ritchie, and E. Burnett.
Journal of Environmental Quality, Vol 3, No 4, p 401-404, October-December, 1974. 4 fig, 3 tab, 9 ref.

Descriptors: *Nitrates, *Chlorides, *Leaching, *Nutrient removal, Soil investigations, Water quality, Lysimeter, Drainage water, Groundwater, Soil water movement.
Identifiers: Nitrate-nitrogen.

Leaching losses of applied NO (3) -N and C1 (-) from a swelling clay soil were measured using an undisturbed field drainage lysimeter. Nitrate-N and C1 (-), applied at 110 and 279 kg/ha, respectively, were detected in drainage water collected at a depth of 125 cm after the first large rainstorm. Applied fertilizer was leached when percolating rainwater carried the applied materials through large connected pores, bypassing other soil water inside soil structural units. Even though applied fertilizer began to be lost with the first rainstorm, concentrations of NO (3) -N and c1 (-) were not high until large amounts of water had drained below the root zone. Much more native soil nitrate was leached than soil nitrate concentrations in unfertilized plots would have indicated. The data indicate that leaching losses of nitrate ... mineralization may be greater than those o... plied nitrate when accumulated drainage is ... mm following fertilizer application (Skoge... Colorado State)
W76-00724

UPTAKE OF INORGANIC MERCURY BY ... SEDIMENTS,
A. Kudo, and J. S. Hart.
Journal of Environmental Quality, Vol 3, No ... 273-278, July-September, 1974. 7 fig, 21 ref.

Descriptors: *Mercury, Rivers, *Sedim... *Kinetics, Water quality, Water pollu... *Canada, *Absorption, *Bottom sediments
Identifiers: *Ottawa River, Mercuric chloride.

The kinetics of uptake of inorganic mercu... mercuric chloride by a variety of freshwater ... sediment types typical of Ottawa River sedim... were studied to determine the influence of m... ry concentration in water, hydrodynamic eff... sediment depth, aerobic and anaerobic condit... and two types of water. Uptake appears to de... strongly on concentration of mercury in wate... water velocity, and not on sediment depth or ... type. No significant difference in uptake rates ... observed between aerobic and anaerobic c... tions during the 10 days studied. (Skoge... Colorado State)
W76-00725

NITRATE CONCENTRATIONS IN DEEP ... CORES AS RELATED TO SOIL PRO... CHARACTERISTICS,
Californai Univ., Riverside. Dept. of Soil Sci... and Agricultural Engineering.
L. J. Lund, D. C. Adriano, and P. F. Pratt.
Journal of Environmental Quality, Vol 3, No ... 78-82, January-March, 1974. 2 fig, 5 tab, 15 ref.

Descriptors: *Denitrification, *Nitr... *Nitrogen, *Soil profiles, *Soil horizons, Soi... vestigations.

Fifteen sites within a 30-ha study area were ... died to determine the effect of soil profile cha... teristics on nitrate concentrations below the ... zone. The N input, crop removal of N, and w... management were similar for all sites during ... previous 6 years. The soils of the study area ... primarily Alfisos and Entisols of fine-loa... coarse-loamy, sandy and sandy over loamy fa... lies. Nitrate concentrations varied between ... and with depth. The average nitrate concentrat... below the root zone ranged from 4.9 to ... microg/g when expressed on an oven-dry ... basis. Profile characteristics were significa... correlated with the average nitrate concentrati... below the root zone. A regression equation re... ing average nitrate concentration in the 1.8-8 de... to control section characteristics explained 86% ... the variability of the nitrate concentration and ... highly significant. Hence, to minimize grou... water pollution, soil profile characteristics sho... be considered in selecting land for high N in... whether by fertilization or waste dispo... (Skogerboe-Colorado State)
W76-00726

A SURVEY OF THE BORON CONTENT ... CERTAIN WATERS OF THE GREATER LO... DON AREA USING A NOVEL ANALYTIC... METHOD,
Anglian Water Authority, Huntingdon (Engla... Directorate of Scientific Services.
For primary bibliographic entry see Field 5A.
W76-00727

AN AUTOMATIC PUMPING SAMPLER F... EVALUATING THE TRANSPORT OF PES... CIDES IN SUSPENDED SEDIMENT,
J. F. Parr, G. H. Willis, L. L. McDowell, C. E. ... Murphree, and S. Smith.

urnal of Environmental Quality, Vol 3, No 3, p 2-294, July-September, 1974. 1 fig, 3 tab, 7 ref.

scriptors: *Pesticides, *Sampling, Sediments, spended solids, Laboratory tests, Equipment, ater quality, Water pollution sources, Path of llutants.

boratory tests were conducted to evaluate the lity of an automatic pumping sampler for as- sing the transport and concentration of pesti- es in suspended sediment. Pesticide-sediment- ter mixtures were formulated with pesticide- iment ratios ranging from 1:15,000 to 1:500. ter stirring periods of 10 and 60 min, these for- lations were pumped through the sampler and quots collected for pesticide analysis. Recovery DDT, trifluralin, toxaphene, and mirex ex- eded 90%, based on their concentrations im- diately prior to pumping. Adsorption of pesti- es to the various plastic, rubber, and fiberglass mpler components was minimized by the high w velocity and rapid delivery systems which en- ed a short time of contact (Seconds) between sample and internal surfaces. These tests in- ate that the sampler is suitable for use in aluating the transport of relatively water-insolu- pesticides in suspended sediment. (Skogerboe- lorado State)
76-00728

ECIPITATION NITROGEN CONTRIBUTION CLATIVE TO SURFACE RUNOFF SCHARGES,
partment of Agriculture, Lincoln, Nebr.
E. Schuman, and R. E. Burwell.
urnal of Environmental Quality, Vol 3, No 4, p 5-369, Ocotber-December, 1974. 1 fig, 4 tab, 12 .

scriptors: *Nitrates, *Ammonia, Runoff, atershed management, Water quality, Nitrogen, ecipitation, Water pollution sources, Nutrient moval, *Path of pollutants.

mmonia and nitrate concentrations in precipita- n and surface runoff from two adjacent tersheds, fertilized at 168 and 448 kg N/ha, spectively, were studied to determine the rela- e contributions of precipitation N in relation to rface runoff N discharge. The data show that % of the N discharged by surface runoff from sampled events could be accounted for by ecipitation-originated N on the watershed fertil- d at 168 kg N/ha, whereas 53% of the N scharged from the watershed fertilized at 448 kg ha could be attributed to N originating in the ecipitation. However, the data indicate that, on annual basis, the surface runoff N discharge ac- unts for only 20% of that in the total incoming ecipitation. This difference can be accounted for precipitation intensity or duration that did not use runoff, absorption of NH (4) -N by the soil terial, or leaching of NO (3) -N into the soil ofile. (Skogerboe-Colorado State)
76-00729

SIMULATION MODEL FOR PREDICTION F HERBICIDE PERSISTENCE,
tional Vegetable Research Station, Wel- bourne (England).
Walker.
urnal of Environmental Quality, Vol 3, No 4, p 6-401, Ocotber-December, 1974. 5 fig, 1 tab, 10 .

scriptors: *Simulation analysis, *Model stu- es, *Herbicides, Computer models, Soil in- stigation, Meteorological data, Water pollution urces, Path of pollutants.

simulation model for prediction of herbicide rsistence in the field is described. The model mbines the effects of soil temperature and soil isture content on the rates of herbidice loss, termined experimentally under controlled conditions, with the flucturations in surface soil temperature and moisture content in the field. The computer program includes methods of simulating surface soil temperatures and moisture contents from standard meteorological data. When data were used in the simulation model in conjunction with the relevant meteorological information, the patterns of loss of napropamide incorporated 2 to 3 cm in the field could be predicted. Napropamide was lost rapidly when applied to the soil surface, and since the model only takes into account losses through microbial or chemical metabolism, this could not be simulated. Some of the limitations and the potential benefit of the simulation technique for prediction of pesticide persistence are discussed. (Skogerboe-Colorado State)
W76-00730

THE CONTROL OF NITRATE ACCUMULATION IN SOILS BY INDUCED DENITRIFICATION,
Technion-Israel Inst. of Tech., Haifa.
Y. Avnimelech, and A. Raveh.
Water Research, Vol 8, p 553-555, August, 1974. 2 fig, 1 tab, 8 ref.

Descriptors: *Nitrates, *Denitrification, Soil chemistry, Irrigation, Sprinkler, Irrigation, Irrigation effects, Soil profiles, Water pollution control, Path of pollutants.
Identifiers: *Israel.

Large amounts of nitrates are accumulating in the Hula Valley soils and then subsequently being leached to the Sea of Galilee. The nitrate concentration in the soil has been significantly reduced by induced denitrification. Reducing conditions have been achieved by controlled sprinkling of previously dried soil. (Skogerboe-Colorado State)
W76-00732

EFFECT OF SALTS AND SALTS PLUS NITROGEN-15-LABELED AMMONIUM CHLORIDE ON MINERALIZATION OF SOIL NITROGEN, NITRIFICATION, AND IMMOBILIZATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-00735

NITRIFICATION RATE IN BIOLOGICAL PROCESSES,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W76-00738

PROBLEMS OF SCALE AND DETAIL IN ECOLOGICAL MODELLING,
Utah State Univ., Logan. Ecology Center.
For primary bibliographic entry see Field 6G.
W76-00739

MORE ON AN APPROXIMATE SOLUTION FOR NONLINEAR DIFFUSION,
Cornell Univ., Ithaca, N.Y. Coll. of Engineering.
For primary bibliographic entry see Field 2G.
W76-00740

AGRICULTURAL WASTE MANAGEMENT,
American Society of Civil Engineers, New York. Environmental Engineering Div.
For primary bibliographic entry see Field 5G.
W76-00744

INCREASING INTENSIFICATION OF PLANT PRODUCTION AND THE PROBLEM OF CHANGES IN THE NATURAL ENVIRONMENT,
Polish Academy of Sciences, Warsaw. Inst. on Agricultural and Forestry Economics.
W. Byszewski, and B. Dobrzanski.
Postepy Nauk Roln. Vol 19, No 5, p 71-89. 1972. Illus.

Descriptors: Environmental effects, Productivity, Industrial production, Industrial wastes, Plant breeding, Chemical wastes, Fertilizers.
Identifiers: Industrial productivity.

In the process of intensifying plant production the prevention of changes harmful to man in the natural environment is considered. Further studies are recommended on the influence on the environment of such measures as chemical fertilization and plant protection measures, mechanization of plant production, plant breeding, water regulation and plant production systems.--Copyright 1974, Biological Abstracts, Inc.
W76-00766

BIODEGRADATION OF AQUATIC POLLUTANTS,
Rhode Island Univ., Kingston. Dept. of Microbiology.
C. W. Houston.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 273, $3.75 in paper copy, $2.25 in microfiche. Completion Report, (1975). 36 p, 11 fig, 9 tab, 7 ref. OWRT A-050-RI(1). 14-31-0001-5040.

Descriptors: Pesticides, *Biodegradation, *Metabolism, *Herbicides, Pseudomonas, 2-4-D, 2-4-5-T, Organic pesticides, Organic acids, *Pesticide residues, *Pollutant identification.
Identifiers: Co-metabolism.

Organisms isolated from commercial turf farm soil and identified as species of the genus, Pseudomonas, were used to study the utilization of three phenoxy herbicides. 2,4-dichlorophenoxyacetic acid (2,4-D) was readily attacked in a mineral salts medium. 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2-(2,4,5-trichlorophenyxy)-propionic acid (2,4,5-TP) were attacked only in the presence of a growth substrate such as sodium benzoate. Cell yield on benzoate with the latter two compounds did not differ, suggesting a co-metabolic attack. Small quantities of peptone and/or beef extract had little effect on cell yield but markedly increased herbicide utilization. The observed recalcitrance of at least some organics may be attributed to stringent enrichment isolation procedures which do not allow isolation of actively degrading organisms. Similarly, persistence in the environment may be due, in part at least, to the slow attack in the absence of the stimulatory effect of soluble organic compounds, which are of a transient nature in soil and water.
W76-00821

SOIL PHOSPHORUS AVAILABILITY AS MEASURED BY DISPLACED SOIL SOLUTIONS, CALCIUM-CHLORIDE EXTRACTS, DILUTE-ACID EXTRACTS, AND LABILE PHOSPHORUS,
Colorado State Univ., Fort Collins. Dept. of Agronomy; and Colorado State Univ., Fort Collins. Dept. of Soil Sciences.
For primary bibliographic entry see Field 3C.
W76-00825

A TWO-PHASE MODEL FOR THE MISCIBLE DISPLACEMENT OF REACTIVE SOLUTES IN SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-00826

LAND SURFACE EROSION AND RAINFALL AS SOURCES OF STRONTIUM-90 IN STREAMS,
Agricultural Research Service, Durant, Okla. Quality Management Lab.
R. G. Menzel.

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Journal of Environmental Quality, Vol 3, No 3, p 219-223, July-September, 1974. 4 fig, 2 tab, 23 ref.

Descriptors: *Runoff, *Erosion, Strontium, *Streams, Water quality, Radioactivity, Pesticides, Correlation analysis.
Identifiers: Strontium-90.

Strontium-90 concentrations in streams from 1958 to 1967 reflected the changing concentrations in rainfall and accumulation on the land surface. Correlation analysis of data from nationwide sampling networks shows that the Sr-90 concentration in streams was accounted for, on the average, by 1.7% of the rainout 2 months earlier, and annual erosion of 0.58% of the accumulated Sr-90 on the land surface. Direct runoff of Sr-90 in preceding rainfall was highest, 2.0 to 2.2%, in the north central and eastern United States, ranging down to no measurable direct runoff in the southwestern United States. Annual erosion of Sr-90 from the land surface ranged from 0.75% in the Ohio River Basin to 0.17% in the Missouri River Basin. If one allows for differences in time and area of application, these results for land surface erosion indicate the potential movement of persistent, strongly adsorbed pesticides from large land areas. (Skogerboe-Colorado State)
W76-00830

COMPUTER MODELING OF NITROGEN TRANSFORMATIONS IN SOILS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2G.
W76-00831

NITRATE OCCURRENCE IN SOME SOILS WITH AND WITHOUT NATRIC HORIZONS,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-00836

EFFECTS OF SALMON CANNERY WASTES ON WATER QUALITY AND MARINE ORGANISMS,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5C.
W76-00861

TOXIC, SUBLETHAL, AND LATENT EFFECTS OF PETROLEUM ON RED SEA MACROFAUNA,
National Marine Water Quality Lab., Kensington, R. I.
For primary bibliographic entry see Field 5C.
W76-00862

THE EFFECT AND FATE OF CRUDE OIL SPILT ON TWO ARCTIC LAKES,
Fisheries Research Board of Canada, Winnipeg (Manitaba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W76-00863

CONTROLLED FOOD-CHAIN TRANSFER OF DIELDRIN RESIDUES FROM PHYTOPLANKTERS TO CLAMS,
Texas A and M Univ., College Station. Dept. of Biology.
S. R. Petrocelli, J. W. Anderson, and A. R. Hanks.
Marine Biology, Vol 31, No 3, p 215-218, 1975. 1 fig, 27 ref.

Descriptors: *Phytoplankton, *Molluscs, *Primary productivity, *Food chains, *Dieldrin, *Clams, Laboratory tests, Halogenated pesticides, Path of pollutants, Adsorption, *Pesticide residues, Water pollution effects.
Identifiers: Dunaliella peircei, Rangia cuneata, Tissue analysis, Bioaccumulation, Sublethal concentrations

The marine phytoplankter Dunaliella peircei was exposed to a concentration of 10 00 micro grams/liter of the chlorinated hydrocarbon insecticide dieldrin in sea-water solution. After 24 hour exposure, the dieldrin residue level in the alga was 12 10 microgram/gram, corresponding to a magnification factor of 1210. Clams, Rangia cuneata, allowed to feed on dieldrin-contaminated phytoplankters for 48 hours exhibited a magnification of dieldrin residues in tissues up to 54 times greater than the concentration resulting from the resuspension of contaminated algal cells in clean seawater. This study demonstrated the transfer of dieldrin residues in a two-level food chain, i.e., from a contaminated alga to a bivalved molluscs allowed to feed on this alga. (KLein)
W76-00867

SEAGRASSES OF SOUTH-WESTERN AUSTRALIA WITH SPECIAL REFERENCE TO THE ECOLOGY OF POSIDONIA AUSTRALIS HOOK F. IN A POLLUTED ENVIRONMENT,
Western Australia Univ., Nedlands. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-00870

BACTERIOLOGICAL STUDIES OF WICOMICO RIVER SOFT-SHELL CLAM (MYA ARENARIA) MORTALITIES,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-00873

CAUSES OF DECREASE AND DISAPPEARANCE OF THE SEAGRASS POSIDONIA OCEANICA ON THE FRENCH MEDITERRANEAN COAST (CAUSES DE LA RAREFACTION ET DE LA DISPARATION DES HERBIERS DE POSIDONIA OCEANICA SUR LES COTES FRANCAISES DE LA MEDITERRANEE),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
J. M. Peres, and J. Picard.
Aquatic Botany, Vol 1, No 2, p 133-139, June 1975, 5 ref.

Descriptors: *Grasses, *Water pollution sources, *Sewage, *Sediments, Clay, Ecosystems, Environmental effects, Vegetation effects, Soil erosion, Water pollution effects.
Identifiers: *Posidonia oceanica, Gulf of Marseilles(France), *Seagrasses.

Two causes which also represented two stages of the decrease of the seagrass, Posidonia oceanica, were observed in the Gulf of Marseilles. The first cause was determined to be the increase in the level of global pollution, mostly sewage which increased the turbidity of seawater through eutrophication and induced the compensation depth to decrease by 5-8 meters, causing the deepest parts of the beds to disappear. The second cause was related to the increase of clay sedimentation which arose from harnessing the Rhine River. Ecological effects were discussed in relation to the disappearance of Posidonia beds and the existing ecosystems. (KLEIN)
W76-00876

ASSESSING A MARSH ENVIRONMENT FOR WASTEWATER RENOVATION,
Agricultural Research Center, Fort Lauderdale, Fla.
For primary bibliographic entry see Field 5D.
W76-00892

LAND DISPOSAL OF EFFLUENT FROM A SANITARY LANDFILL,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W76-00893

DILUTION AND DECAY OF AQUATIC HERBICIDES IN FLOWING CHANNELS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div of Irrigation Research
E. M. O'Loughlin, and K. H. Bowmer
Journal of Hydrology, Vol 26, No 3/4, p 217-23, August 1975. 7 fig, 1 tab, 9 ref, 1 append

Descriptors: *Path of pollutants, *Herbicide, *Aquatic weed control, *Diffusion, *Dispersion, *Australia, *Tracers, Chemical degradation, Flow, Movement, Analytical techniques, Path of pollutants, Aquatic weeds, Irrigation canals, Open channel flow, Model studies
Identifiers: *Concentration-time curves, Acrolein

The behavior of herbicides injected into flowing irrigation channels for aquatic weed control was analyzed. Solutions to the one-dimensional convective-diffusion equation were given for instantaneous and step-function injections of a decaying tracer. The basic solutions were used to derive methods for determining the degradation rate from field experiments, and the total exposure to the herbicide as the water flows over the weeds. It was shown that some significant aspects of herbicide behavior are unaffected by dispersion, and depend only on the degradation rate constant and the travel time of the material. Observations from trials in irrigation channels in the U.S. and Australia with the herbicide acrolein were analyzed. The herbicide application rates and computed exposures varied greatly. Degradation rate constants were more nearly equal. (Lardner-ISWS)
W76-00895

OCCURRENCE AND DISTRIBUTION OF POTASSIUM IONS IN NATURAL WATERS IN INDIA,
Soil Research Lab., Chandigarh (India).
B. K. Handa.
Journal of Hydrology, Vol. 26, No. 3/4, p 267-276, August 1975. 9 fig, 1 tab, 20 ref.

Descriptors: *Surface waters, *Rain water, *Groundwater, *Potassium, *Distribution patterns, Sodium, *Ions, Chemical analysis, Frequency curves, Rivers, Sampling, Analysis, Water analysis, Investigations, Weathering, Water pollution sources, *Path of pollutants.
Identifiers: *India, Natural waters, K/Na ratio.

A systematic study of the distribution of K ions in rainwaters over India gave a mean value of 0.46 mg/l, with values ranging from 0.1 to 2.3 mg/l (n = 130). Rainwater samples were taken in an industrial area near Calcutta, in a more remote area 350 km away, and in other inland towns. In the case of river waters, the mean value obtained was 3.39 mg/l (n = 676), the range being 1 to 13 mg/l. All major Indian rivers were sampled, with weathering, rainfall and agricultural runoff being the major source of K ions. Groundwater samples were taken in areas of differing geological formation. Groundwaters had a mean value of 8.2 mg/l (n = 3067), the K ion concentration ranging between 1 and 80 mg/l. When the chemical composition of the natural waters was plotted on the equilibrium diagrams for silicate minerals at 25C and 1 atm. pressure, it was found that most waters plot in the kaolinite stability field. However, a few rainwater samples plotted in the stability field of gibbsite. (Lardner-ISWS)
W76-00897

CHLORIDE CONTAMINATION IN ALUM CREEK, CENTRAL OHIO.
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
W. A. Pettyjohn.
Ground Water, Vol. 13, No. 4, p 332-339, July-August 1975. 8 fig, 7 ref.

criptors: *Water pollution, *Chlorides, nes, *Ohio, Brine disposal, Oil wells, Oil ls, Injection wells, Wastes, Pollutants, Surface ers, Groundwater, Water pollution sources, h of pollutants, Seepage, Soil contamination, er quality, Taste, Discharge(Water), Sam-g, Water analysis.
tifiers: *Alum Creek(Ohio).

odically, Alum Creek at the Westerville water ment plant contains excessive concentrations loride, producing a salty taste. The chloride is removed during the water treatment process. ontaminated surface water and groundwater ughout Alum Creek basin contain less than 25 of chloride. Larger concentrations are related an's activity in the basin, particularly oil uction. The chloride content in samples of aminated surface water ranged from 26 to ly 28,000 mg/l, while samples from oil-field e pits ranged between 3,000 and 57,000 mg/l. n a brief examination of the data indicates that of the chloride contamination in Alum Creek ue to: (1) the discharge of oil-field brines tly into the mainstem or its tributaries in the r reaches of the basin, or (2) the discharge of aminated groundwater into streams. In many s, the highly mineralized groundwater that is seeping into the streams may have been con-nated a decade ago. (Sims - ISWS)
-00910

ITU SOIL GAMMA ANALYZER--A NEW ROACH TO DETERMINE THE MOVE-T OF POLLUTANTS IN SOILS.
onal Environmental Research Center, Las s, Nev.
rimary bibliographic entry see Field 5A.
-00912

NNING LAND APPLICATION OF URE,
onsin Univ., Madison.
Massie.
roceedings of Conferences on Farm Animal es, Nitrates and Phosphates in Rural Wiscon-cosystems, Madison, Green Bay, and Eau e, Wisconsin, Feb. 1-5, 1971, p.215-222. 6 tab,

riptors: *Planning, Agricultural runoff, Sur-waters, Soils, Pollutants, Water pollution es, Fertilizers, *Farm wastes.
ifiers: Land disposal, Manure.

levelopment of a system for land application nure must consider land forms, surface ru-and present or possible land use if organic ion is to be kept to a minimum. Livestock cers now need to consider some additional sions when planning application of manure ir land. They must be concerned with move-of nutrients from their fields via the primary r, i.e., surface runoff water. Some soil condi-which may cause problems are internal ge, slow water intake (infiltration) rates, g restrictions or shallow soils, erosion, and cation of the soil body on the landscape. A suggested practices for the application of re to the land is given. Application of these ces will further the conservation effort for n control. Changes will be needed as addi-information from research and experience e available. (Cameron-East Central)
0913

AL, LEGAL, AND ECONOMIC CON-RATIONS OF ANIMAL PRODUCTION IN NIZED AREAS,
imary bibliographic entry see Field 5D.
-0916

INTENSITIES AT CATTLE FEEDLOTS,
Agricultural Extension Service, College n.

For primary bibliographic entry see Field 5A.
W76-00919

NUCLEAR SHIP POLLUTION: NATIONAL AND INTERNATIONAL REGULATION AND LIABILITY,
For primary bibliographic entry see Field 6E.
W76-00921

UNION OIL CO. V OPPEN: RECOVERY OF A PURELY ECONOMIC LOSS IN NEGLIGENCE (NOTE ON CASE ARISING FROM OIL SPILL).
For primary bibliographic entry see Field 6E.
W76-00924

THE BOUNDARY WATERS TREATY OF 1909: DOES IT PROVIDE AN ENVIRONMENTAL CAUSE OF ACTION,
For primary bibliographic entry see Field 6E.
W76-00926

NO DUMPING IN THIS OCEAN: NEARING THE END OF SHIP-GENERATED POLLUTION,
S. I. Kern.
Journal of International Law and Politics, Vol 7, No 3, p 545-573, 1974. 185 ref.

Descriptors: *Water pollution, *International law, *Ships, *Legal aspects, International waters, Governmental interrelations, Oil pollution, Pollutants, Water pollution sources, Water pollution control, Water quality, Wastes, Abatement, Governments, Standards.
Identifiers: *1973 International Convention for the Prevention of Pollution from Ships.

The 1973 International Convention for the Prevention of Pollution from Ships is discussed. The 1973 Covention recognizes the serious consequences of the deliberate, negligent and accidental release of oil and other harmful substances and calls for the elimination of intentional pollution of the marine environment and the minimization of accidental discharges of pollutants. The 1973 Convention represents the first international effort to regulate pollution by noxious substances other than oil and to establish equipment, construction and safety standards designed to minimize the risks of accidental and the desirability of intentional discharge. The 1973 Convention also toughens restrictions on oil discharge and provides for more stringent enforcement. The 1973 Convention applies to ships entitled to fly the flag of a party to the Convention or which operates under the authority of a party. Although the 1973 Convention may bring about a considerable reduction in the discharge of pollutants from ships, economic and technological factors have prevented the imposition of regulations that would totally eliminate vessel-generated pollution. (Nursey-Florida)
W76-00930

TERRITORIAL SOVEREIGNTY AND THE PROBLEM OF TRANSNATIONAL POLLUTION,
For primary bibliographic entry see Field 6E.
W76-00934

UNITED STATES V GAF CORPORATION (ACTION FOR INJUNCTIVE RELIEF FROM DISPOSAL OF ORGANIC WASTES BY DEEP WELL INJECTION).
389 F Supp 1379-1388 (S D Tex 1975). 10 p.

Descriptors: *Texas, *Judicial decisions, *Federal Water Pollution Control Act, *Injection wells, *Waste disposal wells, Permits, Federal jurisdiction, Federal government, Environmental effects, Legislation, Penalties(Legal), Water law, Water pollution, Water pollution control, Water pollution sources.
Identifiers: Injunctive relief, FWPCA Amendments of 1972, Liability(Legal aspects), Effluent discharges, Administration regulations.

Plaintiff federal government sued defendant corporation to enjoin deep-well injection of organic chemical waste, without the approval of the Environmental Protection Agency. Jurisdiction was sought under Section 1319 of the Federal Water Pollution Control Act (FWPCA) which authorizes a civil action to be brought against anyone who discharges a pollutant in contravention of Section 1311. The district court held that the FWPCA does not apply to subsurface wells. The court reasoned that the failure of an amendment to the Act which would have included such activity compelled such a conclusion. The court further held that even if deep-well injection was covered by the Act, there were no effluent limitations established. Thus, defendant's actions would not be violative of the Act. Defendant's motion to dismiss was granted because plaintiff's complaint failed to show a violation of the anti-pollution provisions of the Act. (Jenkins-Florida)
W76-00938

SAVE OUR SOUND FISHERIES V CALLAWAY (ACTION TO ENJOIN DUMPING DREDGED SPOIL INTO NAVIGABLE OCEAN WATERS).
For primary bibliographic entry see Field 5C.
W76-00939

CARCINOGENS COMPLICATE CHLORINE QUESTION,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 46, No 12, p 2638-2640, Dec 1974, 1 tab.

Descriptors: *Louisiana, *Chlorination, *Water quality control, *Public health, *Chlorine, Water purification, Water pollution, Diseases, Potable water, Disinfection, Domestic water, Water quality standards, Water policy, Water pollution effects.
Identifiers: *Cancer, *Studies, *Harmful compounds.

An estimated 1,000 tons of chlorinated organic compounds, some of them known to induce cancer in lab animals, are discharged annually into the nation's waterways as a result of the chlorination of waste water. As a result of this discharge a new problem has been uncovered: the problem of human health effects. The Environmental Protection Agency (EPA) recently released a study of the New Orleans drinking water supply, which indicated the presence of small quantities of sixty-six organic chemicals, many of them chlorinated hydrocarbons. This announcement was issued shortly after a private study indicated the existence of a significant statistical relationship between drinking New Orleans public water and the incidence of cancer in white males in the area. As a result of this study, an EPA study has begun to determine areas in which these compounds occur and to evaluate the health significance of the compounds at the levels found in the waters. The impact the proposed Safe Drinking Water Bill will have on the chlorine issue is explored. There is also a discussion of the alternative disinfectants which may be used in the place of chlorine to treat water. (Hoffman-Florida)
W76-00946

CHEMEHUEVI TRIBE OF INDIANS V FEDERAL POWER COMMISION (ACTION TO DETERMINE JURISDICTION OF FPC OVER THERMAL ELECTRIC POWER PLANTS LOCATED ON NAVIGABLE STREAMS).
For primary bibliographic entry see Field 6E.
W76-00947

LIBRARY U. OF I. URBANA-CHAMPAIGN

U.S. V. WHITE FUEL CORP. (APPEAL FROM CONVICTION OF VIOLATION OF REFUSE ACT).
498F.2d 619 (1st Cir 1974).

Descriptors: *Massachusetts, *Judicial decisions, *Rivers and Harbors Act, *Oil pollution, *Seepage, Water law, Legal review, Legal aspects, Water pollution control, Water pollution, Water pollution sources, Negligence, Adjudication procedure, Law enforcement, Federal government, Legislation, Navigable waters, Land tenure, Oil spills, Oily water, Percolation, Underseepage.
Identifiers: *Absolute liability, *Liability(Legal aspects), *Refuse Act of 1899.

Appellant corporation, an oil tank farm operator, was convicted in federal district court of violating section 13 of the Rivers and Harbors Act of 1899. The conviction was the result of oil seepage from underground deposits on appellant's property into the navigable waters of Boston Harbor. The appellant contended that the government was required to prove scienter or at least negligence on the part of the appellant, and that the lower court erred by precluding the appellant's defense of due care. The federal government contended that evidence at trial of improper booming by the appellant in its attempts to confine the seepage was sufficient to support the conviction. The First Circuit Court of Appeals affirmed and held that the evidence of improper booming was not sufficient to support conviction, but the absence of any proof that a third party was responsible for the leakage was enough to sustain the lower court's holding. (Deckert-Florida)
W76-00948

ATLAS CHEMICAL INDUSTRIES, INC. V. ANDERSON (ACTION FOR DAMAGES FROM DISCHARGE OF POLLUTANTS INTO CREEK CROSSING PLAINTIFF'S LANDS).
For primary bibliographic entry see Field 6E.
W76-00950

CITY OF WAUKENGAN V. POLLUTION CONTROL BOARD (APPEAL FROM PROCEEDING ASSESSING FINES AGAINST CITIES AND CORPORATION).
311 N.E.2d 146 (Ill 1974).

Descriptors: *Waste disposal, *Law enforcement, *Penalties, *Jurisdiction, Judicial decisions, Industrial wastes, Municipal wastes, Sewage Waste treatment, Pollution abatement, Legislation, Illinois, Legal aspects, Water law.
Identifiers: *Separation of powers.

Appeal was taken from an action of the State Pollution Control Board assessing fines against the city and corporation for operating a refuse disposal site without obtaining a permit from the Environmental Protection Agency. Appellant contended that the authority given the Board to impose monetary penalties was a relegation of judicial power in violation of the separation of powers provision of the Constitution of Illinois and the United States Constitution relying on interpretation of the separation of powers provision by the United States Supreme Court and the Supreme Court of Illinois approving delegations of authority to impose civil penalties. The court held the authority granted to the State Board did not violate constitutional mandates. (Proctor-Florida)
W76-00954

LEGAL MEASURES CONCERNING MARINE POLLUTION.
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6E.
W76-00963

POLLUTION OF THE HIGH SEAS: THE OCEANS AS INTERNATIONAL RIVERS.
North Carolina State Univ., Raleigh
For primary bibliographic entry see Field 6E.
W76-00964

MARINE POLLUTION CONTROL AND MAN-MADE ISLANDS,
North Carolina State Univ., Raleigh
For primary bibliographic entry see Field 6G
W76-00966

INTERNATIONAL OCEAN DUMPING OF INDUSTRIAL CHEMICAL WASTE,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6E.
W76-00968

THE QUEST FOR OIL: A DECISIVE FORCE IN THE LAW OF THE ARCTIC SEA PERTAINING TO POLLUTION,
North Carolina State Univ., Raleigh
For primary bibliographic entry see Field 6E.
W76-00969

FLUORIDE POLLUTION,
National Research Council, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-00975

GARDINIER, INC. V. FLA. DEPT. OF POLLUTION CONTROL (PETITION FOR WRIT OF CERTIORARI TO DETERMINE THE VALIDITY OF AN ORDER OF THE DEPARTMENT OF POLLUTION CONTROL).
300 So. 2d 75 (Fla App 1974).

Descriptors: *Water pollution, *Water pollution sources, *Water quality control, *Judicial decisions, Florida, Bays, Fertilizers, Industrial wastes, Water quality standards, Environmental engineering, Water law, Water resources development.
Identifiers: *State agencies, *Water pollution statement.

Writ of Certiorari was granted by the District Court of Appeal to consider the question of the Florida Department of Pollution Control's authority to require as a condition to the extension of a temporary operating permit the posting of a bond which is absolutely forfeitable in the event of failure to strictly adhere to the compliance schedule. The court held that while it would have been permissible to require a bond against which the Department could execute following a judicial determination of an appropriate penalty for failure to abide by the schedule, the absolute forfeiture provisions were beyond the statutory authority of the Department. (Proctor-Florida)
W76-00982

MARINE TOWING, INC. V. RED STAR TOWING AND TRANSPORTATION CO. (ACTION FOR DAMAGES SUFFERED WHEN TUG STRUCK A WRECK IN NAVIGABLE WATERS).
For primary bibliographic entry see Field 6E.
W76-00983

TANKERS AND THE MARINE ENVIRONMENT, PART I.
Hearings--National Ocean Policy Study, Committee on Commerce, U. S. Senate, 94th Congress, 1st Session, January 29, 30, 1975, 146 p.

Descriptors: *Oil spills, *International waters, *Ships, *Navigation, *Coast Guard regulations, *Safety factors, Environmental effects, Drilling, Port authorities, Pacific coast region, Straits, Navigable waters, United States, Pollution, Marine animals, Oil pollution, International law, Alaska, California, Construction, Dispe
Operation and maintenance, Oil
Identifiers: *Liability, *Grounding, *Oil tar
*Very large crude carriers(VLCC's), Hea
Supertankers, Puget Sound, Philadelphia, Na
tion aids, Deepwater ports, Double bottom
kers, Air deliverable antipollution tra
system(ADAPTS), Ports and Waterways S
Act

These Senate Hearings concern Coast Guar
pervision of oil tankers entering U.S. waters
the Ports and Waterways Safety Act of 1972
more and bigger oil tankers seeking to supp
dustralized nations, the threat of disastro
spills has vastly increased. Some of the new
large crude carriers (VLCC's) exceed 50
deadweight tons and have 90 feet drafts. A
amination of recent oil spills around the
reveals new problems in navigation caused
tankers' huge size, and of international co
since many of the tankers are registered in
tries that merely sell them a flag to sail
Liberia alone has registered approximately
cent of the world's operational tankers.
Senate Committee is concerned with insurin
these tankers comply with American safet
liability regulations, as well as with devel
new ways of minimizing the possibility of oi
lage. Construction of deepwater off-loading
ties and antipollution emergency control sy
are either underway or in planning stages
denda to the Hearings include articles on
tanker construction, operations and grour
worldwide. (Parrish-Florida)
W76-00985

MAJOR FLOODS, POOR LAND USE DI
RETURN OF SEDIMENTATION TO NOR
RATES,
Forest Service (USDA), Berkely, Calif. P
Southwest Forest and Range Experiment Sta
For primary bibliographic entry see Field 4D.
W76-00989

THE VARIATION OF DISSOLVED
STITUENTS WITH DISCHARGE IN S
NORFOLK RIVERS,
Yorkshire River Authority, Leeds (England
lution Prevention Dept.
A. M. C. Edwards.
J Hydrol (Amst), Vol 18, No 3/4, p 219-242,
Illus.

Descriptors: *Dissolved solids, Path of pollu
Nitrates, Sulfates, Phosphates, Carbo
Rivers, England, Leaching.

Weekly samples were collected during 1970
the rivers Yare, Tud, Tas and Wensum in No
(England) and analyzed for dissolved Na, K
Mg, Si, Cl, bicarbonate, nitrate, phosphat
sulfate. The relationship between the conc
tion and discharge was examined by regre
analysis. Mg, bicarbonate and, for the Yar
Wensum, P were diluted by increases in disch
Nitrate and sulfate concentrations were posi
correlated with discharge, possibly due to
constituents being derived from the leaching
upper part of the soil profile. K concentrati
creased at the beginning of most storm h
graphs but, like Na, was diluted in other
sions. Large increases in nitrate, sulfate, K, N
and Si occurred in Nov., with accumu
weathered products being flushed from the s
the summer moisture deficit was replenish
was insensitive to changes in discharge durin
1st months of 1970. During the spring and su
it was depleted by diatoms. Calcium concent
was also uncorrelated with discharge, possibl
to being derived from the solution of caldiu
bonates and calcium sulfate. The rivers we
persaturated calcium carbonate, when com
with the solubility product of calcite and sh
no signs of equilibrating.--Copyright 1974, Bi
cal Abstracts, Inc.
W76-00991

SSOLVED LOAD AND TENTATIVE SOLUTE DGETS OF SOME NORFOLK TCHMENTS,
rkshire River Authority, Leeds (England). Pol-on Prevention Dept.
M. C. Edwards.
rol (Amst), Vol 18, No 3/4, p 201-217, 1973, s.

scriptors: *Dissolved solids, Path of pollutants, rates, Sulfates, Phosphates, Rivers, England, rage effluents, Leaching.

ekly water samples were collected during 1970 n the rivers Yare, Tud and Wensum in Norfolk gland). The relationships between discharge the variations in the dissolved load of Na, K, Mg, Si, Cl, bicarbonate, nitrate, phosphate sulfate were examined by regression analysis. correlation coefficients were all highly signifi- and the slopes of the regression equations in t cases approximated to plus 1. The slope coef-ients for nitrate and sulfate were greater than 1, as their concentration increased with harge. Most of the phosphate in the Yare and nsum was derived from sewage effluent, which diluted by high flows. The most effective harges for transporting all constituents were e of winter baseflow. Only 20% of the load removed from the catchments between May Oct. Tentative solute budgets showed that fall was a significant input for K, Mg, Na, Cl sulfate. For chloride in the Tud this amounted 5%. Sewage contributed less than 15% of the t of the constituents except P. It was unlikely more than 10% of the fertilizer N was lost by hing to the rivers. Ca was derived from the tion of carbonate and sulfate minerals. The um carbonate erosion rate was 58.0 Mg/km2 he Yare and 39.2 Mg/km2 for the Tud. The osion rate, correct for depletion by diatoms 1.1 Mg/km2 for the Yare and 0.77 Mg/km2 for Tud.--Copyright 1974, Biological Abstracts,

-00992

HOLOGICAL CHANGES OBSERVED IN IES FOLLOWING POISONING BY GRANU-ED HERBICIDES-ATRAZINE AND DIU-: RAPID DETERMINATION OF THE TOX-Y OF LOW PESTICIDE CONCENTRA-NS (IN RUSSIAN),
rimary bibliographic entry see Field 2I.
-00995

Effects Of Pollution

IRONMENTAL SURVEY OF TWO IN-M DUMPSITES-MIDDLE ATLANTIC T. SUPPLEMENTAL REPORT.
rimary bibliographic entry see Field 5E.
00511

USE OF A PELAGIC TROPHODYNAMIC IN FOR STUDYING THE TRANSFER OF ALLIC POLLUTANTS, (IN FRENCH),
e dEtudes et de Recherches de Biologie et anographie Medicale, Nice (France).
rimary bibliographic entry see Field 5B.
00577

OBLEM IN THE USE OF INSECTICIDES ADDY FIELDS IN WEST MALAYSIA: A STUDY,
try of Agriculture and Lands, Kuala Lumpur ysia). Div. of Agriculture.
rimary bibliographic entry see Field 5B.
00581

PHYTOPLANKTON AND EUTROPHICATION IN SOME LAKES IN VESTFOLD, SOUTH NORWAY,
Oslo Univ. (Norway). Inst. of Marine Biology; and Oslo Univ. (Norway). Dept. of Limnology.
K. A. Okland.
Blyttia, Vol 31, No 2/3, p 175-187, 1973, Illus, English summary.

Descriptors: *Lakes, *Eutrophication, *Phytoplankton, Europe, Aquatic plants, Plankton, Lake stages.
Identifiers: Anabaena-spp, Microcystis-aeruginosa, Norway, Vestfold.

The formerly mesotrophic lakes have lately become eutrophic with mass development of Anabaena spp. and Microcystis aeruginosa. The long and severe winter of 1969-70 mobilized nutrients from the bottom sediments. The hot summer of 1970 contributed to the rich algae development.--Copyright 1974, Biological Abstracts, Inc.
W76-00613

GREEN BAY SELF-PURIFIES ALGAL NUTRIENTS,
Wisconsin Univ., Madison.
G. P. Fitzgerald, M. S. Torrey, and G. C. Gerloff.
Water and Sewage Works, Vol 122, No 6, p 58-61, June, 1975. 2 fig, 4 tab, 15 ref.

Descriptors: *Algae, *Algal control, *Municipal wastes, *Lake Michigan, *Cladophora, *Nutrient removal, *Phosphorus, Industrial wastes, Drainage, Water purification, Tertiary treatment, Lakes, Water pollution effects.
Identifiers: Green Bay(Wis), Fox River(Wis), Algal nutrients.

The effects of industrial and municipal waste loadings on the nutrition of the algae along the Fox River at Green Bay, Lake Michigan, were studied. Tests of nutrient concentration in algal samples are used to evaluate the fate of pollutants in aquatic environments. It was proposed that significant reduction of the algal nutrients might be achieved if the removal of phosphorus from their effluents is implemented by major cities in the Great Lakes drainage basin. Sources of nutrients to Green Bay, water flow patterns, phosphorus, nitrogen, and iron concentrations, and bioassays of Cladophora populations were determined. A direct linear relationship was found between concentration of PO4-P and growth of algae in control cultures; addition of nitrogen and/or iron increased growth signficantly. The growth of algae in Lake Michigan seems generally to be limited by available phosphorus during the algal growing season. In early winter, Green Bay, which uses tertiary treatment of municipal and industrial wastes, is effectively self-purified, and does not supply Lake Michigan with major quantities of algal nutrients. It was recommended that other Great Lake areas apply similar phosphorus removal and self-purification practices. (Kramer-FIRL)
W76-00615

MAN'S ACCELERATION OF HYDROGEOCHEMICAL CYCLING OF PHOSPHORUS: EUTROPHICATION OF INLAND AND COASTAL WATERS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
W. Stumm.
Water Pollution Control, Vol 74, No 2, p 124-133, 1975. 7 fig, 2 tab, 14 ref.

Descriptors: *Cycling nutrients, *Eutrophication, *Phosphorus, *Lakes, Ecosystems, Environmental effects, Hydrogeology.
Identifiers: Nutrient loading, Lake restoration.

Human activities disturb the natural balance between hydrogeochemical cycles (phosphorus, carbon, nitrogen) in the ecosystem. Pollution results from this disturbance between the rate of production (photosynthesis) and destruction (respiration). This presentation discusses some relevant factors that regulate nutrient composition and productivity. An evaluation is made of the impact of civilization of terrestrial and oceanographic transformations of phosphorus. Also, simple models on phosphorus transformation are reviewed. In particular, correlations have been made between areal nutrient loading of lakes and their enrichment as a function of a specific variables such as depth, retention period, and mixing. It is hoped that an understanding of such eutrophication may help in quantifying measures for lake restoration. (Kramer-FIRL)
W76-00620

NUTRIENT EXCHANGE IN WATER-SEDIMENT INTERFACE AND ITS EFFECTS ON WATER QUALITY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
C. P. C. Poon.
Available from National Technical Information Service Springfield, Va 22161 as PB-246-275, $3.25 paper coyp, $2.25 in microfiche. Completion Report (1975), 13 p, 17 fig, 15 tab, 3 ref. OWRT B-052-RI(1). 14-31-0001-4123.

Descriptors: Water quality, *Pollutant identification, Chemical analysis, *Sediments, Nitrogen, *Phosphorus, Carbon, Metals, Ammonia, Kinetics, Absorption, *Rhode Island, Bays, Sediment-water interfaces, Nutrients, Iron Manganese.
Identifiers: Sediment profiles, *Narragansett Bay(R.I.), Organic carbon, Marine sediments, *Ammonia-nitrogen.

Profiles of carbon, nitrogen, phosphorus, iron and manganese of Narragansett Bay sediments were established after extensive physical and chemical analyses of samples taken at various locations in the Bay. These profiles reveal the history of pollution in the Bay. Relationships between metals and the nutrients were also established. Clear trends of increasing NH3-N and available-P concentrations in deeper layers of sediments with corresponding decrease of organic carbon were detected. Dredging of the sediment could expose these higher NH3-N and available-P concentrations to the overlying water. Microcosm study showed that the sediments could act as a source or sink of phosphorus under various conditions. The dissolved oxygen content, phosphorus concentration in water and available-P in sediment dictate the amount of P release or uptake by the sediment. In heavily polluted areas, the seawater flushing rate increases the phosphorus flux rate and vice versa. The steady state flux rate of P varies from 20 to 440 ug-P/m2/hr in Narragansett Bay depending on location and flushing rate. No NH3-N release from Narragansett Bay sediments occurs and consequently only phosphorus is considered a potential nutrient source in the sediment.
W76-00715

INCREASING INTENSIFICATION OF PLANT PRODUCTION AND THE PROBLEM OF CHANGES IN THE NATURAL ENVIRONMENT,
Polish Academy of Sciences, Warsaw. Inst. on Agricultural and Forestry Economics.
For primary bibliographic entry see Field 5B.
W76-00766

EFFECTS OF SALMON CANNERY WASTES ON WATER QUALITY AND MARINE ORGANISMS,
Washington Univ., Seattle. Fisheries Research Inst.
D. L. Beyer, R. E. Nakatani, and C. R. Staude.
Journal Water Pollution Control Federation, Vol 47, No 7, p 1857-1869, July 1975, 8 fig, 1 tab, 6 ref.

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Descriptors: *Water quality, *Canneries, *Industrial wastes, Tidal effects, Salmon, Marine animals, Water pollution sources, Dissolved oxygen, Salinity, Hydrogen ion concentration, *Alaska, Water pollution effects.
Identifiers: *Petersburg(Alas).

Although cannery wastes have presented problems in some Alaskan communities, dissolved oxygen, salinity, water temperature, and pH values in waters affected by discharges near Petersburg showed no appreciable differences from control areas. Results of a survey of intertidal macrofauna indicated that these organisms were not adversely affected by the discharges. Small areas of subtidal waste accumulations and increased turbidities and biochemical oxygen demand in the immediate area of the discharges were the only problems encountered. Tests with undiluted wastes held in a closed system demonstrated that changes in pH and dissolved oxygen may reach undesirable levels in a short period of time. The effects of the discharges were minimized in the field situation, however, by the excellent flushing action of the tides, which resulted in a high dilution and dispersion of the wastes. (Klein)
W76-00861

TOXIC, SUBLETHAL, AND LATENT EFFECTS OF PETROLEUM ON RED SEA MACROFAUNA,
National Marine Water Quality Lab., Kensington, R. I.
R. Eisler.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 535-540, March 1975; 1 fig, 7 tab, 19 ref.

Descriptors: Oil, *Water pollution sources, Aquatic animals, Ecosystems, Enivornmental effects, Growth stages, Coral, Molluscs, Crustaceans, Teleosts, Population, Water pollution effects, *Oil pollution, Dispersion, Path of pollutants, *Toxicity, *Lethal limit.
Identifiers: *Oil dispersants, *Crude oils, Octocorals, Echinoderms, Bioaccumulation, *Red Sea microfauna.

The effects of crude oils, an oil dispersant, and oil-dispersant mixtures on juvenile and adult octocorals, crustaceans, molluscs, echinoderms and teleosts from the Red Sea were investigated. Effects included reduction in feeding rate and egg case deposition of predatory gastropods, interference with substrate attachment by mussels, liver enlargement and lowered blood hematocrit values in fish, and bioaccumulation of crude oils in octocorals. The introduction of petroleum into Red Sea ecosystems was found to be potentially disruptive of established feeding-predator patterns, reproductive patterns, defence mechanisms, and stable populations. (Klein)
W76-00862

THE EFFECT AND FATE OF CRUDE OIL SPILT ON TWO ARCTIC LAKES,
Fisheries Research Board of Canada, Winnipeg (Manitaba). Freshwater Inst.
N. B. Snow, and B. F. Scott.
In: 1975 Conference on Prevention and Control of Oil Pollution:Proceedings, p 527-534, March 1975. 5 fig, 5 tab, 31 ref.

Descriptors: Oil, *Oil spills, *Lakes, Model studies, Benthos, Water quality, Environmental effects, Ecosystems, Arctic, Water pollution effects, Path of pollutants, *Oil pollution.
Identifiers: *Crude oils

Two crude oil spills were carried out on adjacent lakes which were partitioned to obtain experimental and control areas within the same lake. Two types of crude oil were used. Concentration of study was the immediately affected littoral benthos. Comparative data on nitrogen, carbon, and seston weight values, number and distribution of organisms and diatom species colonizing on styrofoam balls, and total chloraphyll concentrations of the pre- and post-oil spill lakes were among the characteristics studied. (Klein)
W76-00863

TOXICITY OF NITRITE TO CHANNEL CATFISH,
Southern Illinois Univ., Carbondale Fisheries Research Lab.
M. Konikoff
The Progressive Fish-Culturist, Vol 37, No 2, p 96-98, April 1975; 1 fig, 3 tab, 13 ref

Descriptors: *Channel catfish, *Toxicity, *Nitrites, Bioassay, Fish physiology, Fish behavior, Environmental effects, Survival, Water pollution effects.
Identifiers: Ictalurus punctatus, *Bioaccumulation, Tissue analysis.

Percent survival values for channel catfish (Ictalurus punctatus) at various nitrite concentrations were determined. The behavior of catfish exposed to lethal and sublethal nitrite concentrations was observed. Nitrite poisoned catfish died with the mouth opened, gill covers closed, pectoral and dorsal spines erected, and body musculature relaxed. The blood was a distinctive dark chocolate brown color which persisted several hours after death. (Klein)
W76-00864

BODY TEMPERATURE CHANGE OF BLUEGILL SUNFISH SUBJECTED TO THERMAL SHOCK,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Biology.
J. R. Stauffer, K. L. Dickson, A. G. Heath, G. W. Lane, and J. Cairns, Jr.
The Progressive Fish-Culturist, Vol 37, No 2, p 90-92, April 1975, 2 tab, 5 ref.

Descriptors: *Fish physiology, *Heated water, *Sunfishes, *Powerplants, Effluents, *Temperature, Cooling water, Environmental effects, *Thermal pollution, Water pollution effects.
Identifiers: Heating rates, Fish body thickness.

The lack of significant correlation between length, weight, and condition factors, and time to reach equilibrium with environmental temperature suggested that heating rates were not solely dependent upon the weight or body thickness of bluegill sunfish. Blood flow rate was determining to be an important factor in determing heat exchange. The sunfish required more time to reach equilibrium when exposed to lower temperatures than when exposed to higher temperatures. (Klein)
W76-00865

EFFECT OF ZINC ON THE SETTLEMENT OF THE OYSTER CRASSOSTREA GIGAS,
Imperial Coll. of Science and Technology London (England). Applied Geochemistry Research Group.
C. R. Boyden, H. Watling, and I. Thornton.
Marine Biology, Vol 37, No 3, p 227-234, 1975, 5 fig, 5 tab, 9 ref.

Descriptors: *Oysters, *Molluscs, *Growth stages, *Heavy metals, *Zinc, Environmental effects, Animal physiology, Larvae, Behavior, Water quality, Resistance, Water pollution effects, Lethal limit.
Identifiers: Crassostrea gigas, Bioaccumulation, Sublethal concentrations.

The influence of zinc upon the pattern and success of settlement was examined in the oyster Crassostrea gigas. Late larvae were more tolerant of zinc than embryos. A delay in settlement was recorded in treatments containing zinc as low as 125 micrograms/liter, and numbers of larvae settling was reduced in the presence of zinc. Larvae sut to zinc immediately prior to settlement s evidence of slowing in behavioral develo Thus larvae which settled in the presence o however when ongrown in clean water wer able as controls. Zinc at concentrations of 2 500 micrograms/liter suppressed spat grow recovery was rapid upon subsequent on-g in clean water conditions. (Klein)
W76-00866

CONTROLLED FOOD-CHAIN TRANSFI DIELDRIN RESIDUES FROM PHYTOP TERS TO CLAMS,
Texas A and M Univ., College Station. D Biology.
For primary bibliographic entry see Field 5E
W76-00867

INDUCTION OF ARYL HYDROCA (BENZO (ALPHA) PYRENE) HYDROX IN FISH BY PETROLEUM,
Fisheries Research Board of Canada. St (Newfoundland). Biological Station
J. F. Payne, and W. R. Penrose
Bulletin of Environmental Contaminatio Toxicology, Vol 14, No 1, p 112-116, July tab, 12 ref.

Descriptors: *Salmonids, *Trout, *Fish ph gy, *Oil pollution, *Organic comp *Enzymes, Water quality, Environmental Toxicity, Biochemistry, Water pollution eff
Identifiers: *Brown Trout, *Capelin, Mallo losus, *Aryl hydrocarbon hydroxylases, Liver, Enzyme activity, Tissue analysis, B mulation.

In both Brown trout (Salmo trutta) and (Mallotus villosus), significant increases sepcific activity of liver aryl hydrocarbon h ylases (AHH) were observed within 17 da treatment with crude oil. Activity in the gil treated fish differed from the controls. Th no noticeable difference in mortality or b between treated and control fish. Specific ties of liver AHH of trout from clean and p lakes were significantly different, indicati environmental factors were reflected enyzme levels. (Klein)
W76-00868

DISSOLVED OXYGEN DEPLETION IN S BIOASSAY SYSTEMS,
Virginia Polytechnic Inst. and State Blacksburg. Dept. fo Fisheries and Sciences.
For primary bibliographic entry see Field 5A
W76-00869

SEAGRASSES OF SOUTH-WESTERN TRALIA WITH SPECIAL REFERENCE T ECOLOGY OF POSIDONIA AUSTRALIS F. IN A POLLUTED ENVIRONMENT,
Western Australia Univ., Nedlands. D Botany.
M. L. Cambridge.
Aquatic Biology, Vol 1, No 2, p 149-16 1975, 3 fig, 7 ref.

Descriptors: *Grasses, Ecology, *Coasts, Sampling, Growth stages, Life cycles, In wastes, Seasonal, Data collections, *Au Soil types.
Identifiers: *Seagrasses, *Posidonia au Zostera mucronata, Heterozostera tas Posidonia ostenfeldii, Syringodium isoet Thalassodendron pachyrhizum, Amphibo tarctica, Amphibolis griffithii, Halophila South-Western Australia, Co Sound(Australia).

New ecological data, including soil types, patterns, seasonal changes, and reactions t

re given for the nine species of seagrasses of
-western Australia, with special references
sidonia australis in Cockburn Sound, a pol-
marine environment. (Klein)
00870

CURY IN FISH IN THE DERWENT
ARY, TASMANIA, AND ITS RELATION
THE POSITION OF THE FISH IN THE
D CHAIN,
nonwealth Scientific and Industrial Research
ization, Hobart Australia. Tasmanian re-
l.
rimary bibliographic entry see Field 5A.
00871

ERIOLOGICAL STUDIES OF WICOMICO
R SOFT-SHELL CLAM (MYA ARENARIA)
TALITIES,
land Univ., College Park. Dept. of
biology.
neko, R. R. Colwell, and F. Hamons.
peake Science, Vol 16, No 1, p 3-13, March
2 fig, 7 tab, 18 ref.

iptors: *Mollusks, *Clams, *Bacteria,
al physiology, Laboratory tests, Cultures,
matics, *Mortality, Water pollution effects,
pollution sources, *Maryland, Chesapeake

fiers: *Bacteriology, Mya arenaria, Vibrio,
obacteriaceal, *Wicomico River(Md).

al screening tests were performed in experi-
designed to detect the presence of potential
gens in the soft-shell clam Mya arenaria. Of
ins isolated from test plates at cold tempera-
8 strains were found to cause death of
ls within 48 hours and to show good growth
legrees C within one week. Two of the 8
, one a member of the Enterobacteriaceae
e other a Vibrio sp., were considered to be
ial pathogens for the soft-shell clam. (Klein)
00873

TRO INHIBITION OF FISH BRAIN AT-
ACTIVITY BY CYCLODIENE INSECTI-
S AND RELATED COMPOUNDS,
sota Univ., St. Paul. Dept. of Entomology,
ies and Wildlife.
Yap, D. Desaiah, L. K. Cutkomp, and R. B.

n of Environmental Contamination and
logy, Vol 14, No 2, p 163-167, August 1975.
6 ref.

ptors: *Chlorinated hydrocarbon pesticides,
ity, Fish physiology, *Enzymes, Inhibitors,
ical techniques, *Insecticides, Water pollu-
fects, Inhibition.
iers: *Bluegills, Lepomis macrochirus,
tory responses, *ATPases, *Cyclodienes,
Bioaccumulation, Tissue analysis.

tissue from the blue gill fish, Lepomis
chirus, was used as the enzyme source to
re inhibitory responses of three ATPases
+ ATPases and Na+K+ ATPase) to several
iene and related compounds at 20.8
olar concentration. A comparison of ID50
(Inhibition-Dose response at 50% level) for
chlorinated hydrocarbon insecticides on
ondrial Mg2+ and Na+K+ ATPases was
Klein)
0874

URY RESIDUES IN FATHEAD MIN-
, PIMEPHALES PROMELAS
ESQUE, CHRONICALLY EXPOSED TO
YL-MERCURY IN WATER,
al Water Quality Lab., Duluth, Minn.
lson, D. I. Mount, V. M. Snarski, and T. W.
nd.

Bulletin of Environmental Contamination and Toxicology, Vol 14, No 2, p 129-133, August 1975. 2 tab, 14 ref.

Descriptors: *Heavy metals, *Organic compounds, *Mercury, *Minnows, *Metabolism, Fish physiology, Life cycles, Path of pollutants, Water quality, Toxicity, Water pollution effects, Absorption.
Identifiers: *Fathead minnows, Pimpephales promelas, *Methylmercury, Bioaccumulation, Tissue analysis.

Fathead minnows, Pimephales promelas, were exposed to methylmercury water concentrations ranging from 0.018-0.247 micrograms/liter. After 48 weeks of exposure(lifespan), the total mercury residues in the whole fish body ranged from 1.47-10.90 micrograms/gram. The pronounced uptake of methylmercury and a limited ability to excrete it by the fish suggested that even very low concentrations of methylmercury in water might result in unacceptable tissue levels in fish. (Klein)
W76-00875

CAUSES OF DECREASE AND DISAPPEARANCE OF THE SEAGRASS POSIDONIA OCEANICA ON THE FRENCH MEDITERRANEAN COAST (CAUSES DE LA RAREFACTION ET DE LA DISPARATION DES HERBIERS DE POSIDONIA OCEANICA SUR LES COTES FRANCAISES DE LA MEDITERRANEE),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5B.
W76-00876

TRACE METAL LEVELS IN BEACH DIPTERANS AND AMPHIPODS,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5A.
W76-00877

MERCURY LEVELS IN GEORGIA OTTER, MINK, AND FRESHWATER FISH,
Duke Power Co., Charlotte, N.C. Design Engineering Dept.
For primary bibliographic entry see Field 5A.
W76-00878

NUCLEAR SHIP POLLUTION: NATIONAL AND INTERNATIONAL REGULATION AND LIABILITY,
For primary bibliographic entry see Field 6E.
W76-00921

UNION OIL CO. V OPPEN: RECOVERY OF A PURELY ECONOMIC LOSS IN NEGLIGENCE (NOTE ON CASE ARISING FROM OIL SPILL).
For primary bibliographic entry see Field 6E.
W76-00924

SAVE OUR SOUND FISHERIES V CALLAWAY (ACTION TO ENJOIN DUMPING DREDGED SPOIL INTO NAVIGABLE OCEAN WATERS).
387 F Supp 292-310 (DRI 1974). 19 p.

Descriptors: *Judicial decisions, *Federal Water Pollution Control Act, *Permits, *Legislation, *Dredging, Rhode Island, Administration, Contract administration, Federal government, State governments, Water law, Governmental interrelations, Legal review, Environmental effects, Legal aspects, Water pollution, Water pollution control, Water pollution sources.
Identifiers: *National Environmental Policy Act, *Injunctive relief, *Environmental impact statement, *Marine Protection Research and Sanctuaries Act, *Corps of Engineers, Environmental Protection Agency, Fill permits.

Plaintiff, a non-business corporation, composed of corporations which harvest and process seafood, sued to enjoin defendants, U. S. Army Corps of Engineers and a private corporation retained under government contract, from dumping dredged spoil into the ocean. The thrust of plaintiff's complaint was that defendants failed to comply with procedural requirements of various federal laws relating to environmental protection by neglecting to obtain permits, give public notice and opportunity for hearing, and make public disclosure of environmental impact information prior to commencing dredging. Defendants argued that the dumping was part of a project authorized prior to the Marine Protection, Research and Sanctuaries Act and, therefore, required no permit. The court held that the funding for the final stage of the project was appropriated subsequent to statutes requiring a permit, and defendant, therefore, was enjoined from further dumping until compliance with permit procedures. The court further held that 33 U.S.C. section 1344 did not exempt the Corps from complying with permit procedures in authorizing the Secretary of the Army, rather that the Environmental Protection Agency (EPA), to issue permits for dredging and filling for the purpose of improving navigation. (Jenkins-Florida)
W76-00939

THE QUEST FOR OIL: A DECISIVE FORCE IN THE LAW OF THE ARCTIC SEA PERTAINING TO POLLUTION,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6E.
W76-00969

FLUORIDE POLLUTION,
National Research Council, Washington, D. C.
E. Groth, III.
Environment, Vol 17, No 3, p 29-38, 1975. 3 photo, 86 ref.

Descriptors: *Fluorides, *Environmental effects, *Research priorities, *Research and development, *Pollutants, Industrial wastes, Air pollution, Animal populations, Aquatic populations, Toxicity, Phosphates, Aluminum, Water supply, Water treatment, Pollution abatement, Wastes, Air pollution effects.
Identifiers: Research data, Effluent charges.

Preliminary research data indicate that fluoride can result in significant ecological harm, even at low levels. This chemical has received low priority in research and regulatory control efforts. There is evidence that accumulated levels of fluoride in plant and animal life have caused a major increase of fluoride in aquatic and land food chains. Reduction in fluoride emissions by control regulations may be offset by the rapid growth of the phosphate fertilizer and aluminum industries which emit fluoride. While fluoride pollution mainly occurs from industrial sources, there are more sources of fluoride in the aquatic environment. Although fluoride is present in natural water sources, industrial and domestic sewage discharge accounts for most fluorides. The chemical is best known for its ability to prevent tooth decay and is added to water systems in about one half the communities in the United States. It is likely that fluoride interacts with other pollutants to produce a more toxic effect. Calcium may act to reduce fluoride concentrations. The lack of solid experimental data on the toxic effects of fluoride demonstrates that this chemical should be given higher priority in future environmental research projects. (Jenkins-Florida)
W76-00975

MARINE TOWING, INC. V. RED STAR TOWING AND TRANSPORTATION CO. (ACTION FOR DAMAGES SUFFERED WHEN TUG STRUCK A WRECK IN NAVIGABLE WATERS).
For primary bibliographic entry see Field 6E.
W76-00983

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LEGAL ASPECTS OF PHOSPHATE MINING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6G.
W76-00984

HUMAN ECOLOGY. PROBLEMS AND SOLUTIONS,
P. R. Ehrlich, A. H. Ehrlich, and J. P. Holdren.
W H Freeman and Co.: San Francisco, Calif, 1973, 304 p, Illus.

Descriptors: *Environmental effects, Ecology, Human population, Human resources, Natural resources, Technology.

A comprehensive introducation to human ecology, this book focuses attention on the biological and physical aspects of man's present prlblems. Demography, man's utilization of resources, the world food problem and man's assaults on his own health and on ecological systems are described. Interrelationships of population growth, affluence and technological errors are causes of what may be the most serious crisis ever faced by man. Having established the need to hald population growth, the discussion turns to what is being done in this area, and to what needs to be done. After a discussion of possible population control methods the other aspects of human behavior are evaluated Emphasis is placed on reducing each individual's demand and deleterious impact of the environmental resources. Man's problems are intertwined and it is concluded that ecological problems will not be solved unless racism, poverty, exploitation and war are tackled at the same time. This book is intended for use in various courses dealing with environmental problems and ecology.--Copyright 1973, Biological Abstracts, Inc.
W76-00987

AGRICULTURE'S PLACE IN THE ENVIRONMENT: CONSIDERATIONS FOR DECISION MAKING,
Agency for International Development, Washington, D.C.
W. H. Garman.
J Environ Qual, Vol 2, No 3, p 327-333, 1973.

Descriptors: *Eutrophication, Aquatic plants, Path of pollutants, Nutrients, Organic matter, Agricultural chemical, Fertilizers.

Chemical elements at or near the earth's surface and in the air are in a continuing state of movement or subject to forces which can cause movement. The outstanding characteristic is that outgo of inorganic elements (including plant nutrients) from land to water greatly exceeds input over most land surfaces of the earth. Nutrients have been accumulating under water along the shorelines of the world for ages of time. When man entered the geological picture, this movement (or water-enrichment process) became more active as the soil was worked to grow food. This caused more soil particles, nutrients and organic matter to move into water bodies. Eutrophication is nature's ageold geological process of utilizing these nutrients and the sun's energy for the accumulation of organic matter in aqueous environments. Without eutrophication, there would be no marine life or coal oil or muck deposits on out planet. All bodies of water have 4 stages of life: birth, existence, old age and disappearance. Examples of each stage are found in the USA, Canada, Siberia, Brazil, and Africa, in surroundings practically untouched by man and certainly untouched by agriculture. Only very small quantities of nitrates and mineral nutrients are necessary to sustain luxuriant growth of aquatic plants. Most water bodies contain ample amounts for this purpose. Few situations likely can ever be found where stopping agricultural contribution would stop eutrophication. Slowing the process of eutrophication will be difficult because it will require control over C inputs. Organic matter from sewage, manure runoff, industrial wastes, or wildlife is utilized by bacteria, which evolve CO2 for promoting the growth of aquatic plants. Once the process is in operation, it is difficult to control because photosynthesis releases O2 to stimulate bacteria. When they and other plants die, their C and nutrients are consumed by more bacteria, which in turn, evolve more CO2 to grow more algae, thus continuing the cycle. Although details of this symbiosis are not fully understood, enough is known to realize that removing P or N from city effluents or from farm fertilizers will not control growth of aquatic vegetation in natural or man-made bodies of water.--Copyright 1974, Biological Abstracts, Inc
W76-00988

PATHOLOGICAL CHANGES OBSERVED IN FISHES FOLLOWING POISONING BY GRANULATED HERBICIDES-ATRAZINE AND DIURON: RAPID DETERMINATION OF THE TOXICITY OF LOW PESTICIDE CONCENTRATIONS (IN RUSSIAN),
For primary bibliographic entry see Field 21
W76-00995

SPHAEROMA TEREBRANS: A THREAT TO THE MANGROVES OF SOUTHWESTERN FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
A. Rehm, and H. J. Humm.
Science (Wash DC), Vol 182, No 4108, p 173-174, 1973, Illus.

Descriptors: *Mangrove swamps, Florida.
Identifiers: Sphaeroma terebrans, *Wood borers, Borers.

S. terebrans, a wood-boring isopod, is destroying the prop roots of red mangroves (Rhizophora mangle) along the southwestern coast of Florida (USA) to such an extent that the Ten Thousand Islands and mangrove fringes of the mainland are steadily shrinking. Mangroves of the Florida Keys apparently are free of this wood borer.--Copyright 1974, Biological Abstracts, Inc.
W76-00998

5D. Waste Treatment Processes

VALLEY FORGE AREA WASTEWATER TREATMENT FACILITY, CHESTER COUNTY, PENNSYLVANIA, FINAL ENVIRONMENTAL IMPACT STATMENT.
Environmental Protection Agency, Philadelphia, Pa. Region III.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-236 325, $17.25 in paper copy, $2.25 in microfiche. September, 1974. 426 p, 15 fig, 48 tab, 21 plates, 10 append.

Descriptors: *Administration, *Treatment facilities, *Waste water treatment, Sewers, Federal Water Pollution Control Act, Water quality control, Environmental effects, Grants, *Pennsylvania.
Identifiers: *Construction grants, *Environmental Impact Statement, *Valley Forge(Penn).

An administrative action was taken by the Environmental Protection Agency involving the granting of financial assistance for the construction of a 8 mgd waste water treatment facility and related sewage collection system. Several municipalities in the area of Valley Forge, Pennsylvania, will receive construction grants as dictated in the Federal Water Pollution Control Act Amendments. This final Environmental Impact Statement (EIS) details the climatology, topography, hydrology, geology, man-made environment, air and water quality, population, and land management characteristics of the area serviced. The proposed facilities were designed to meet the waste water treatment needs for eight a Chester County, as projected to the year 19 to alleviate public health hazards, improve quality, and permit orderly growth pattern area. Evaluations were made of several tives including individual treatment proces sewer line locations. Processes such as n tion, landfilling, landspreading, and spray tion were also considered. Included in th EIS are a list of Federal, State and local a from which comments on the Draft EIS h received, a detailed glossary, and 21 map region. Appendices refer to the history proposed project; letters and petitions fr sidents; designated historical and archae sites; existing environmental controls; lists industries; and a summary of a Public held on January 10, 1974. (Kramer-FIRL)
W76-00508

STREAM POLLUTION ABATEMENT B PLEMENTAL PUMPING,
Richmond City Dept. of Public Utilities
C. W. Reh and W. E. Sadler
Available from the National Technical In tion Service, Springfield, Va 22161, as PB-2 $5.25 in paper copy, $2.25 in microfiche. E mental Protection Agency, Report EPA-6 035, February 1975. 108 p, 39 fig, 5 tab, 17 r

Descriptors: *Waste water treatment, *By *Treatment facilities, *Pumping plants, Co tion, Costs, Pumps, Sewage treatment, *V Pollution abatement.
Identifiers: *Richmond(Va)

A major structure (a Supplemental Pumpi tion), and several ancillary structures were to the Richmond, Virginia, Wastewater Tre Plant to achieve the project objective bypassing while a new grit chamber was be nected ahead of the existing Main Pumpi tion. The Supplemental Pumping Station w structed by sinking a two-compartment, sh ferdam around an existing 72-in concrete and rearranging the influent sewer flow pa that the sewage was redirected to the site Supplemental Pumping Station. Redirectio sewage flow was effected by the reconstru a junction chamber and by the insertion o cially designed removable bulkhead. The demonstrated that it is possible to cut in sewage treatment plant addition without by raw sewage. If no special provisions hav made in the existing works or new facility for additions without bypassing, special will be required to achieve the no bypassin tive. Pumping units of standard desing used. Pumps were variable speed motor vertical centrifugal pumps. The time for and construction of so-called temporary f is likely to approach that required for conv facilities. This project required 36 mont cost of the supplemental pumping station purtenant works was $900,000. (Orr-FIRL)
W76-00509

FORECASTS OF THE EFFECTS OF AI WATER POLLUTION CONTROLS ON WASTE GENERATION.
Stone (Ralph) and Co., Inc., Los Angeles, C
Available from the National Technical I tion Service, Springfield, Va 22616, as PB- $17.25 in paper copy, $2.25 in microfiche. E mental Protection Agency, Report EPA-6 095b, December, 1974. 799 p, 41 fig, 242 ref, 4 append.

Descriptors: *Waste water treatment, wastes, *Industrial wastes, *Sewerage, P abatement, Water pollution control, Air po Suspended solids, Dissolved solids, Bioc oxygen demand, Water pollution sources.

The effects of air and water pollution tr measures on the generation of solid wast

ated. The solid wastes from pollution control identified for the following sectors by their al air or water pollutant constituents and the ent process employed: animal feedlots; min- d milling; meat and dairy products; canned reserved fruits and vegetables; grain indus- per and allied products; chemicals and allied cts; petroleum extraction, refining, and ortation; cement manufacturing and struc- lay; blast furnace and basic steel industries; oundry and ferroalloy industries; primary condary smelting and refining of nonferrous ; electric power plants; sewerage; and lous solid waste residues. The wastes were rized by type and by location (rural or . Total solid wastes from pollution control ies were estimated for 1971 and projected 75, 1980, and 1985. The major air pollutants nerate solid waste residues when controlled rticulates and sulfur oxides. The major pollutants capable of generating solid waste es when controlled are suspended solids, ed solids, and biological oxygen demand. of the commonly-used wet process air pollu- eatments also generate suspended solids add to the total water pollutant load. Acids er form solid wastes when inert salts are by their neutralization or precipitation. runoff is a significant source of pollution. IRL)
0510

UATION OF NEW REVERSE OSMOSIS RANES FOR THE SEPARATION OF COMPOUNDS FROM WASTEWATER, ND ANNUAL SUMMARY REPORT,
Univ. at Urbana-Champaign. Dept. of En- ental Engineering.
. Chian, and H. H. P. Fang.
ble from the National Technical Informa- rvice, Springfield, Va 22161, as ADA-005 .25 in paper copy, $2.25 in microfiche. cal Report No UILU-ENG-74-2028, Oc- 974. 103 p, 17 fig, 34 tab, 18 ref, 3 append.

tors: *Membrane processes, *Reverse os- *Waste water treatment, Organic com- , Laboratory investigation, Mathematical Design criteria, Analytical techniques. ers: NS-100 membrane, Toxic compounds, al analysis.

of the second year of a study on the on of reverse osmosis membranes for on of toxic compounds from waste water sented. In previous study, it was deter- hat the best results in treating waste water ng of various small polar organic com- were accomplished with the use of NS-100 nes and aromatic polyamide membranes. oth showed excellent results in removing ganic or inorganic solutes, the NS-100 had f a higher magnitude and was chemically logically more stable than the aromatic de membrane. Thus, an extensive study ducted on the characteristics of the NS- mbrane, including the formulation of atical models to predict its performance arious conditions. Also, a comparison newly developed reverse osmosis mem- obtained from other laboratories was ch as NS-200 and PBI, but NS-100 proved in performance. The tests on the NS-100 e included its performance in the of pesticides, thirteen model compounds, fatty acids, amines; the effects of pH on rmance of the membrane; and optimiza- nembrane performance as demonstrated rial and other design criteria; and the re- of the NS-100 membrane to chlorine. -FIRL)
12

LUATION OF WATER REUSE FOR PAL SUPPLY,
Illinois Univ., Carbondale.
in, and D. O. Baumann.

Available from the National Technical Information Serv' e, Springfield, Va 22161, as AD/A-005 053, $8.75 in paper copy, $2.25 in microfiche. Army Engineer Institute for Water Resources, Ft. Belvoir, Va. Report 74-11, December, 1974. 266 p, 31 fig, 33 tab, 2 append. DACW43-73-C-0013.

Descriptors: *Water supply, *Water demand, *Municipal water, *Water reuse, *Waste disposal, Potable water, Waste water treatment, Recycling, Effluents, Public health, Economics, Simulation, Planning, *Colorado, *Computer programs.
Identifiers: *Colorado Springs(Colo).

Because of an increase demand on municipal water supply systems, reuse as an alternative water source has been considered. Reuse was defined as any additional application of waste water, including inadvertent and unplanned withdrawal and use of water from a river with an upatream discharge, directed and planned secondary treatment, or use of effluents for irrigation, recreation, or industry. An evaluation was made as to whether recycling renovated waste water could be an acceptable and economically efficient alternative. An investigation was made to identify the opinions of state public health officials and consulting engineers toward the practicability of using renovated water. A simulation model as applied to the Colorado Springs, Colorado, water supply system is detailed. Alternative plans, providing for reuse only when required were suggested. Manipulation of water supply and water demand was discussed and the public acceptance or rejection of using renovated water was debated. (Kramer-FIRL)
W76-00514

INTERCEPTOR SEWERS AND SUBURBAN SPRAWL: THE IMPACT OF CONSTRUCTION GRANTS ON RESIDENTIAL LAND USE. VOLUME I, ANALYSIS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-236 477, $7.00 in paper copy, $2.25 in microfiche. Council on Environmental Quality, Washington, D.C., July 31, 1974. 191 p, 8 fig, 1 tab, 2 append.

Descriptors: *Interceptor sewers, *Constructions, *Environmental effects, Federal project policy, Design, *Land use, Land management, Administration, Water resources development, Sewerage.
Identifiers: *Public policy analysis, Federal funding, Sewer construction, Residential development.

A study was conducted in the summer of 1974 to consider the relationships between interceptor sewer construction financed by the Environmental Protection Agency and residential development patterns in rapidly growing communities. A statistical analysis of data from fifty-two interceptor projects was made and case studies for eight local projects with high excess capacity and the largest proportion of vacant developable land in the service area were analyzed. A discussion is given of major interceptor planning and land policy issues, with recommendations for changes in EPA procedure based upon policy analysis. These recommendations included: withholding of Federal funds for excess capacity; re-evaluation of interceptor staging of project design in rapidly growing areas; application of realistic standards for per capita flow; improvement of population forecasting techniques; consideration of environmental effects of interceptor-induced land use; and publicity of community costs and benefits of interceptor-induced growth so as to increase public participation in the planning process. (Kramer-FIRL)
W76-00515

O AND M GUIDE FOR THE SUPPORT OF RURAL WATER-WASTEWATER SYSTEMS.
Conset, Inc., Washington, D.C. National Demonstration Water Project.

For primary bibliographic entry see Field 5F.
W76-00530

COMMON FUNDAMENTALS IN THE TECHNOLOGIES OF WATER AND WASTE-WATER TREATMENT, (A VIZ-ES SZENNYVIZ-TITAS TECHNOLOGIAIAJAUAK KOZOS ALAPJAI),
P. Benedek, L. Bulkay, and S. Vallo.
Vizugyi Kozlemenyek, No 2, p 210-223, 1975. 8 tab, 3 ref.

Descriptors: *Waste water treatment, *Water treatment, *Treatment facilities, *Biological treatment, Separation techniques, Potable water, Organic compounds.
Identifiers: *Hungary.

A comparison was made between technologies used in water treatment and waste water treatment in Hungary. It was shown that both types of processes are based on the separation of substances according to size. Several tables are presented, systematically comparing the efficiencies of various technologies which are common to both potable water treatment and waste water treatment. In the treatment of waste water, the transformation of organics into inorganics and their subsequent removal, usually by biological treatment, is frequently necessary. In treatment of drinking water, the goal is generally the removal of undesired substances and sometimes the addition of specific chemicals. Despite the difference in objectives, this paper recommends that professionals in the fields of water treatment and waste water treatment note the similarities of the technology applied. (Kramer-FIRL)
W76-00561

DESIGNING WATER TREATMENT PLANTS AT THE CIVIL ENGINEERING CONSULTING FIRM MELYEPTERV (VIZTISZTITAS TERVEZES A MELYEPTIESI TERVEZO VALLALATNAE),
Melyepterv, Budapest (Hungary).
For primary bibliographic entry see Field 5F.
W76-00562

INFILTRATION INFLOW PROGRAM FOR EPA GRANTS,
R. A. Beckwith.
Water and Sewage Works, Reference Number, p 16-18, April 30, 1975. 2 fig.

Descriptors: *Infiltration, *Inflow, *Legislation, *Sewerage, *Sewage treatment, Treatment facilities, Rainfall-runoff relationships, Sewers, Federal Water Pollution Control Act, Groundwater, Simulation analysis, *Waste water treatment.
Identifiers: Sewer repair, Infiltration inflow programs.

Federal legislation requires that municipalities applying for new grant funds for interceptors and sewage treatment plants prove their existing sanitary sewer systems are not subject to excessive infiltration/inflow (i/i). Infiltration is primarily leakage from the groundwater table and occurs into cracked pipe, deteriorated lateral connections, or offset joints. Inflow is mainly the water entering a sanitary sewer system from rainfall runoff. Inflow sources are relatively easy to locate and correct, and include manhole covers, roof leaders, area-way drains, basement drains, and connections between storm and sanitary sewers. An i/i program consists of analysis and evaluation. The analysis portion is an overall study of various subsystems, accomplished by studying records of the sewage plant, water plant, and rainfall of an area, and by making selected flow measurements at predetermined key manholes. A choice is then made between continued treatment and evaluation for possible rehabilitation, depending upon which is more economical. Following analysis, evalua-

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tion may be performed on recommended areas and consists of a physical survey, rainfall simulation, preparatory cleaning, television inspection, and a cost effective analysis. By locating exact defects and estimating the amount of leakage, it can best be determined whether it is more costly to rehabilitate the defect or to continue treatment of the infiltration/inflow. (Kramer-FIRL)
W76-00563

PREPARING AN INFILTRATION/INFLOW ANALYSIS,
Gilbert Associates, Inc., Reading, Pa.
P. A. Podolick.
Water and Sewage Works, Reference Number, p 31-32, 34, April 30, 1975. 1 tab.

Descriptors: *Infiltration, *Inflow, *Sewerage, *Waste water treatment, Construction, Analytical techniques, Cost analysis, Repairs, Weirs, Sewers.
Identifiers: *Infiltration/inflow, Sewer rehabilitation.

In order to receive Federal funding for upgrading a secondary treatment plant to provide tertiary treatment, it was necessary for an engineering and consulting firm in Pennsylvania to perform an analysis to demonstrate to the EPA that the sewer system discharging into the treatment works was not subject to excessive infiltration/inflow (i/i). First, a review for the past several years of total daily waste water flow was done to compute average daily dry and wet weather flows. Geological and geographic factors were considered, which might influence quantities of waste water flow. Engineering reports and contract documents for the original construction of the sewage facility were also reviewed. Field measurements of drainage from potential infiltration/inflow sources were made between midnight and 5:00 a.m. for key manholes, in order to insure that the measurements were due to i/i and not to domestic sewage. V-notch weirs were used for measurements directly into the sewer pipes. Cost of eliminating infiltration/inflow were determined by sewer system evaluation and a calculation of sewer rehabilitation costs. A cost effective analysis was performed, and it was found that the annual cost of eliminating all the i/i possible and treating the rest was $11,355, while the annual cost of treating i/i for the design life of the facility would be $33,226. Thus, Federal law stated that 'possible' excessive infiltration/inflow existed and that further evaluation was required. (Kramer-FIRL)
W76-00564

THE SELECTION AND APPLICATION OF SLURRY PUMPS,
For primary bibliographic entry see Field 8C.
W76-00565

HOW TO ANALYZE INFILTRATION/INFLOW,
Environmental Protection Agency, Cincinnati, Ohio.
D. J. Cesaro, and R. Field.
Water and Sewage Works, Reference Number, p 84-88, 90, April 30, 1975. 2 tab, 11 ref.

Descriptors: *Infiltration, *Inflow, *Reviews, Analytical techniques, *Sewerage, Construction, Rehabilitation, Rainfall, Inspection, Water quality, Opearting costs, Maintenance costs, Flooding, *Waste water treatment.
Identifiers: Cost-effectiveness, Infiltration/inflow analysis, Sewer repair, Sewer system evaluation.

A review of the analysis of infiltration/inflow (i/i) is presented. A thorough evaluation should consider factors of cost-effectiveness, including: the cost and size of new sewers if excessive i/i is to be permitted; the operation and maintenance costs for handling local sewer surcharges, clean-up of flooding, and damages to flooded private properties; costs of repair of pavement cave-ins or washouts of subsurface utilities caused by i/i, costs of removal of soil, debris, and tree roots which enter sewers through defective sewer joints and pipes; and need for increases in treatment or handling capacities because systems are overloaded with excessive infiltration and inflow volumes. The required sewer system evaluation survey, consisting of five phases (Physical survey, rainfall simulation, preparatory cleaning, internal inspection, and survey report) is outlined. Guidelines for cost analyses of infiltration and inflow are also given. Examples of an infiltration reduction program in Oklahoma and an inflow reduction program in Illinois illustrate some of the problems encountered. Although a cost-effective solution is strongly recommended, it was concluded that one should always consider the overall impact of any changes on overall water quality. (Kramer-FIRL)
W76-00566

PROCESS FOR TREATING SEWAGE SLUDGE,
American Cyanamid Co., Stamford, Conn. (Assignee).
H. P. Panzer, and K. W. Dixon.
United States Patent 3,894,948. Issued July 15, 1975. Official Gazette of the United States Patent Office, Vol 936, No 3, p 1008, July, 1975. 1 fig.

Descriptors: *Patents, *Sludge treatment, *Dewatering, *Polymers, *Waste water treatment, Anions, Cations.
Identifiers: Polyquaternary compounds.

A patent was granted for a method of sewage sludge treatment. An effective amount of a water-dispersible polyquaternary polymer is added to the sewage, comprising the reaction product of dimethylamine, a polyfunctional amine, and a difunctional epoxy compound selected from the group consisting of epihalohydrins and precursors for epihalohydrins which under alkaline conditions are readily converted into the corresponding epoxy compounds and their mixtures. The polyquaternary polymer structures are detailed, and the residues obtained from the compounds and their reactions are described. The amount of anions present is large enough to satisfy anionic requirements of the cationic portion of the polyquaternary compound and thus water is removed from the sludge. (Kramer-FIRL)
W76-00567

APPARATUS FOR DISSOLVING LARGE QUANTITIES OF OXYGEN IN WATER,
Naigai Kogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
T. Aoki.
United States Patent 3,882,205. Issued May 6, 1975. Official Gazette of the United States Patent Office, Vol 934, No 1, p 327, May, 1975. 1 fig.

Descriptors: *Oxygenation, *Aeration, *Patents, Equipment, *Water treatment, *Waste water treatment, *Dissolved oxygen.

The patented apparatus described is designed for dissolving large quantities of oxygen in water. It is composed of: an air-tight cistern; a tank on the cistern; an elongated inner vessel in the cistern with a perforated partition between it and the tank; a rotary shaft with a perforated drum, positioned perpendicularly within the tank; pipes for supplying oxygen to the drum and water to the tank; spouts which discharge water into a receiving dish on the rotary shaft; and, conduits to feed water and to control discharge of water to the dish from the spouts. Water is finely divided by the high speed rotation of the dish caused by rotation of the rotary shaft. Oxygen is released into a circular space between the outer circumference of the drum and the inner circumference of the tank through perforations, due to the centrifugal force of the drum also being rotated by the shaft. Water and oxygen mixing occurs continuously, dissolving a large volume of oxygen into the water. The water enters the inner vessel through [illegible] forated partition and is then passed into the [illegible] through an opening on the vessel. (Orr-FIR
W76-00570

MOBILE PURIFYING PLANT FOR WATER,
B. O. Lundqvist
Canadian Patent 971,688. Issued July 2 Patent Office Record, Vol 103, No 29, p 1975

Descriptors: *Waste water treatment, *B treatment, Water purification equ *Patents, *Treatment facilities
Identifiers: *Mobile treatment systems, A

A portable biological purification system patented, which is small enough to be eas ported by highway. This waste water t system is within a housing and consists sions for biological purification, for mi minum sulfate into the biologically purifie for separating the deposited particles water, and for collection of these separat cles in a tank. All the equipment is locate wall of the housing, so that a compact created. (Kramer-FIRL)
W76-00572

AEROBIC/ANAEROBIC COMP DEVICE AND METHOD OF COMPOST
F. B. Chester.
United States Patent 3,890,129. Issued 1975. Official Gazette of the United Stat Office, Vol 935, No 3, p 1178, June, 1975.

Descriptors: *Waste water treatment, *Aerobic conditions, *Anaerobic diges ganic compounds.
Identifiers: *Composting(Aerobic-Anaero

A method for composting organic waste has been patented. The organic waste m first placed in a rotatable container which mesh sides. The open mesh sides of the are covered with a removable outer moisture excluding material. The conta the waste material is periodically rotated horizontal axis with the outer cover attac rotation mixes the material in the conta contacts the material with air. The perio tion of the container is then stopped an second cover is placed over the material container. The inner cover directly con material in the container and prevents freely contacting the waste. The inner covers are then removed from the conta rotation of the container (uncovered) is The continued rotation effects discharge posted waste material from the containe the open mesh sides of the continer. (Orr-
W76-00574

AUTOMATIC SCUM REMOVAL TROU
Harrisburg Steel Co., Pa.
P. R. Johnson.
United States Patent 3,890,289. Issued 1975. Official Gazette of the United Stat Office, Vol 935, No 3, p 1222-1223, Jun fig.

Descriptors: *Waste water treatment, Equipment, Scum, Water treatment, Au *Separation techniques.
Identifiers: Floating scum removal.

An apparatus to remove floating scum surface of liquid in a tank has been pate apparatus is composed of a trough with s support means in the tank secured to th drive means, connector means sucured the drive means and the trough, means to the drive means, and, liquid sensor mea energize the drive means. The support m

ed to permit vertical movement of an edge of
f the sidewalls of the trough. The trough is
moved in one direction by the drive means.
iquid sensor mean stops the travelling of the
h after the edge of the trough has moved a
termined distance below the surface of the
in the tank. The drive means are then ener-
to move the trough in another direction.
FIRL)
00578

SURE SEWAGE SYSTEM AND MEANS,
tech, Inc., Fort Worth, Tex. (Assignee).
'kholder.
d States Patent 3,897,600. Issued August 5,
Official Gazette of the United States Patent
e, Vol 937, No 1, p 20, August, 1975. 1 fig.

iptors: *Patents, *Sewage treatment,
age, Tanks, Pipes, Equipment, *Waste
treatment, Gravity.
fiers: *Pressure sewage system, Gravity-fed
e.

essure sewage system which has been
ly patented is described. The unit accumu-
and treats gravity-fed sewage which it
es through an inlet pipe from a local source.
within the sewage are macerated and the
ng effluent is discharged under a pre-deter-
pressure into a pressurized sewer main. The
consists of: an accumulation tank, with
wardly converging walls and a frusticonical
n section to receive the sewage; a central
e treatment unit, which is normally sub-
d below the sewage level in the tank and
on the converging walls; a small diameter
rge pipe which extends upward from the
ent unit and connects to the pressurized
main; and, a pump within the treatment unit
exposed macerating blades, which are
ble about the central axis of the frustoconi-
ction. Thus, sewage is agitated and swirled
vortex while the treatment unit is in opera-
Kramer-FIRL)
0579

NERATOR FOR RAW SEWAGE,
Boulger, Inc., Flushing, N.Y. (Assignee).
imary bibliographic entry see Field 5E.
0580

ESS FOR TOTAL SEWAGE TREAT-
x, Inc., New York. (assignee).
ongved.
States Patent 3,900,394. Issued August 19,
Official Gazette of the United States Patent
, Vol 937, No 3, p 951-952, August, 1975. 1

ptors: *Patents, *Sewage treatment,
ated sludge, *Waste water treatment,
ical treatment, Denitrification, Aerobic
ent, Sedimentation.
iers: Clarification.

inuous activated sludge sewage treatment
s has been patented. Steps include: the in-
ion of a first sewage liquid into a reservoir
eed of at least 0.8 feet per second; aeration
sewage liquid which has been set into circu-
motion; aerobic decomposition of the
and depletion of the oxygen content; in-
ion of additional sewage liquid into the ox-
raved first sewage liquid; simultaneous
ication of the first sewage liquid and aero-
composition of the second sewage liquid,
noval of the treated sewage liquid for sedi-
ion and clarification. The removal rate is
imately the same as the rate of injection of
w sewage liquid. The resulting clarified
ffluent is discharged and at least a portion
ettled sludge is returned to the liquid in the
ir. The average retention time of the liquid in the reservoir is at least 24 hours. (Kramer-FIRL)
W76-00584

TREATMENT OF SEWAGE OR CONTAMINATED WATER,
D. A. Swales.
Canadian Patent 972,652. Issued August 12, 1975. Patent Office Record, Vol 103, No 32, p 34, August, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Coagulation, Costs, Acids.
Identifiers: *Chrome, Cost effectiveness.

A patent was issued for a method for the treatment of sewage or other contaminated waters. The process consists of forming a coagulant by dissolving chrome residue or chrome ore in a strong mineral acid, such as sulfuric acid or hydrochloric acid. By using a treatment method of coagulation which employs these substances, improved cost effectiveness is achieved. (Kramer-FIRL)
W76-00585

SWITCHING VALVE FOR CONTINUOUS FILTERING DEVICES,
Agfa-Gevaert, Mortsel (Belgium).
For primary bibliographic entry see Field 8C.
W76-00586

SELF-CLEANING ROTARY FLUID FILTRATION SYSTEM,
D. C. Marsh.
Canadian Patent 972,691. Issued August 12, 1975. Patent Office Record, Vol 103, No 32, p 42, August, 1975.

Descriptors: *Filtration, *Water treatment, *Waste water treatment, *Patents, Screens.

A filtration system in which contaminated liquid is passed through a filter screen is described. A pressure drop causes the contaminants to adhere to the screen. Back-flow of fluid through the screen caused by a hydrodynamic or aerodynamic skid removes any contaminants from the screen. Therefore,a self-cleaning filtration system is created. (Orr-FIRL)
W76-00587

WASTE TREATMENT SYSTEM WITH ENCLOSED SCREEN UNIT,
V. Materese.
Canadian Patent 973,304. Issued August 26, 1975. Patent Office Record, Vol 103, No 34, p 1, August 26,1975.

Descriptors: *Waste water treatment, *Waste treatment, *Solid wastes, Slurry, *Patents, Treatment facilities, Equipment, *Screens, Chemicals, Disinfection, Mixing.

The patented waste treatment system described includes means for grinding solid wastes, mixing them with liquids to form a pumpable slurry and pumping the slurry to a waste treatment tank. The waste treatment tank has a screening section in which an enclosed screen unit is loosely positioned. The slurry is pumped to the interior of the screen unit and then flows outwardly through the foraminous side walls of the screen unit into a mixing section of the treatment tank. As the screened waste material is passed from the screening section of the treatment tank to the mixing section, it is mixed with chemical additives. A series of perforated baffles in the mixing section insures that the additives and screened waste material are intimately mixed and retained in the tank for a sufficient period of time to disinfect the mixture prior to its ejection from an outlet in the mixing section of the treatment tank. (Orr-FIRL)
W76-00588

DEVICE AND APPARATUS FOR TREATING LIQUIDS SUCH AS DRINKING WATER AND WASTE WATER,
For primary bibliographic entry see Field 5F.
W76-00589

SEWAGE TREATMENT APPARATUS AND METHOD,
G. W. Smith.
Canadian Patent 972,088. Issued July 29, 1975. Patent Office Record, Vol 103, No 30, p 89, July, 1975.

Descriptors: *Patents, *Activated sludge, *Waste water treatment, *Biological treatment, Sewage treatment, Effluents, Sludge disposal, Aeration, Waste disposal.

A method and its related equipment were patented for use in the activated sludge treatment of sewage. Raw sewage is mixed with return (activated) sludge and the mixed sewage liquor is then confined in a tank and aerated. There may also be additional sub-surface aeration. Air is circulated through the sewage in a pre-determined vertical flow pattern through several flow passageways within the tank. After the required amount of time, the treated sewage liquids are removed from the tank; sludge is removed for recycle or ultimate disposal; and effluent water may be clarified. (Kramer-FIRL)
W76-00591

AERATION METHOD AND APPARATUS,
D. Di Gregorio, and G. L. Shell.
Canadian Patent 972,878. Issued August 12, 1975. Patent Office Record, Vol 103, No 32, p 84, August, 1975.

Descriptors: *Patents, Equipment, *Aeration, *Waste water treatment, Separation techniques.
Identifiers: *Aerators, Shearing mechanism.

A submerged aerator was patented and includes a non-impelling bubble shearing mechanism which rotates with and below an axial flow impeller. This impeller forces liquid down past the bubble shearing mechanism and entrains these bubbles in the downward flow. Increased retention of the shared bubbles in the lower portion of the liquid body thus results. The shearing mechanism is composed of: a hollow cylinder (with an open bottom to receive bubbles); a closed top concentrically secured to a rotating shaft; and a slotted sidewall through which the bubbles are released and sheared. (Kramer-FIRL)
W76-00592

SEWAGE FLOCCULATING AND SEDIMENTATION TANK UNIT,
K. R. Dunkers, and J. H. Johansson.
Canadian Patent 972,880. Issued August 12, 1975. Patent Office Record, Vol 103, No 32, p 85, August, 1975.

Descriptors: *Sewage treatment, Tanks, *Patents, *Flocculation, *Waste water treatment, Sedimentation, Flow, *Settling basins.

A highly efficient tank for the treatment of sewage has been patented. The unit is a combined sewage flocculating and sedimentation process. Flow of sewage is described, such that when seen in a plate view, the sewage is directed substantially perpendicular to the longitudinal direction of the tank. When viewed from a vertical section, flow is obliquely upward. Connections between the flocculating portion and the sedimentation protion are such that sewage flows through the tank and then to an outlet within the sedimentation portion. (Kramer-FIRL)
W76-00594

LIBRARY U. OF I. URBANA-CHAMPAIGN

METHOD OF AND APPARATUS FOR FILTERING,
Hydromation Filter Co., Livonia, Mich (assignee).
G. Hirs.
United States Patent 3,900,395. Issued August 19, 1975. Official Gazette of the United States Patent Office, Vol 937, No 3, p 952, August, 1975. 1 fig.

Descriptors: *Patents, *Filters, *Waste water treatment, Separation techniques, *Filtration.
Identifiers: Filter bed media, Black walnut shells, Anthracite coal, Solids removal.

A new filter device was patented for the removal of solids from liquid. The filter media bed is composed of anthracite coal, characterized by primary filter granules and smaller, fine, flaky particles. The bed has upper inlet and lower outlet surfaces; the smaller particles tend to accumulate at the inlet surface after backwashing and thus inhibit penetration into the anthracite bed by particulate contaminants. Positioned on the inlet surface of the bed are black walnut shells. These should be selected of a size and shape in relation to the fine anthracite particles in order to intermix with them after backwashing. The walnut shells have an angular, three-dimensional configuration to inhibit binding off the bed of anthracite coal byfine particles and accumulated contaminants. In the inlet surface of the filter media bed, a portion of the black walnut shells are intermixed with the smaller fine particles and provide a more effective penetration of the inlet surface by contaminants, thus improving the filter capabilities of the bed. (Kramer-FIRL)
W76-00595

PROCESS FOR TREATING WASTE WATER EFFLUENT HAVING ODOURS,
Daikyo Oil Co. Ltd., Tokyo (Japan). (assignee).
K. Tsutsumishita, Y. Yokoyama, and T. Egawa.
United States Patent 3,903,250. Issued September 2, 1975. Official Gazette of the United States Patent Office, Vol 938, No 1, p 333, September, 1975.

Descriptors: *Patents, *Waste water treatment, Effluents, Hydrogen ion concentration, Odor, Hydrogen sulfide, Organic compounds.
Identifiers: *Odor control.

A patent was issued for a treatment method for waste water containing hydrogen sulfide, mercaptanes, or other sulfur compounds, in order to eliminate undesirable odors. The pH of the waste water should be adjusted to 6 to 7 with a mineral acid or alkali; the waste water effluents may then be contacted with a hydrocarbon oil. The oil must have an average molecular weight of 100 to 300, and the mixing ratio of the hydrocarbon oil to the waste water effluent should be ten to one:one by volume. (Kramer-FIRL)
W76-00596

METHOD FOR THE PURIFICATION OF WATER,
N. Lindquist.
Canadian Patent 972,484. Issued August 5, 1975. Patent Office Record, Vol 103, No 31, p 85, August, 1975.

Descriptors: *Patents, *Sewage treatment, *Flocculation, *Nutrient removal, Biological treatment, *Waste water treatment, Oxygen, Microorganisms, Organic matter, Biodegradation, Iron, Aluminum, Separation techniques.

A method has been patented for the purification of sludge-free sewage which contains biodegrable organic material and phosphorus compounds. Sewage is passed through an oxygen-containing gas, and through a permeable bed which contains at least one metal of the group consisting of iron aluminum. The flow of the oxygen-containing gas is then adjusted, as is the thickness of the bed, so that biological microorganisms capable of decomposing the organic material in the sewage are formed in at least one portion of the bed. At the same time, at least one metal is dissolved from the bed in a large enough quantity to flocculate most of the phosphorus compounds in the sewage. The permeability of the bed must be such that the formed phosphorus-containing flocs, together with the formed biological flocs, are able to pass through the bed and the sewage is then separated from these flocs. (Kramer-FIRL)
W76-00597

RECENT TRENDS OF INSTRUMENTATION, CONTROL, AND AUTOMATION SYSTEMS FOR WASTEWATER TREATMENT SYSTEMS (GESUIDO SHISUTEMU SEIGYO NO DOKO),
S. Kato, and T. Oto.
Hitachi Hyoron, (Hitachi Review), Vol 57, No 2, p 3-7, February, 1975. 5 fig, 11 ref

Descriptors: *Instrumentation, *Waste water treatment, *Automation, *Control systems, Sewage treatment, Water treatment, Computers, Treatment facilities, Tertiary treatment.
Identifiers: *Japan.

Recent trends of instrumentation, control, and automation systems for waste water treatment are described. The establishment of a better sewage systems in Japan is urgently needed, with advanced treatment of sewage in large cities necessary because of the increasing populations of these cities. An effective reutilization of waste water is required, and may be accomplished by the establishment of different water lines for different types of water usage. For better control in waste water treatment plants, the concept of a hierarchical system should be employed, in which all controlling units for individual steps in water treatment are interrelated. The use of a computer is essential for this control system. The advantages of such a system are the high reliability and flexibility of the control system in cases of partial malfunctionings of treatment units. Another advantage is the high efficiency in controlling waste water treatment, particularly for large scale treatment plants. (Katayama-FIRL)
W76-00604

WATER MONITORING STATIONS,
Honeywell, Inc., Minneapolis, Minn.
For primary bibliographic entry see Field 5A.
W76-00605

MEASUREMENT OF POWER INPUT IN FLOCCULATION,
Visvesvaraya Regional Coll. of Engineering, Nagpur (India).
For primary bibliographic entry see Field 5F.
W76-00608

USING HYDROGEN PEROXIDE FOR POLLUTION CONTROL.
Water and Sewage Works, Reference Number, p 186-188, April 30, 1975. 5 fig, 7 tab.

Descriptors: *Waste water treatment, *Water pollution control, *Odor, *Activated sludge, Physical properties, *Density, Aqueous solutions, Oxygen.
Identifiers: *Hydrogen peroxide, Mixed liquor suspended solids.

The compound hydrogen peroxide (H2O2) has several applications in pollution control. It has been used for odor control, reduction of bulking in the activated sludge process, for better settling of the mixed liquor suspended solids, and for the addition of oxygen to waste. Hydrogen peroxide itself is not a pollutant and leaves no toxic residues. Because an increasing number of municipalities and industries are utilizing this compound, some of its important physical properties are described. Tables reproduced from the FMC Corporation book entitled 'Hydrogen Peroxide Physical properties Data Book' provide information on p cal properties, measured in density of aqu hydrogen peroxide solutions at zero degrees tigrade, physical properties measured in dens aqueous hydrogen peroxide solutions at 25° a degrees centigrade, weight percent mole fra conversion and average molecular weight hydrogen peroxide-water solutions; densit aqueous hydrogen peroxide solutions in de Baume; and the composition of particular do position products. (Kramer-FIRL)
W76-00616

CORROSION CONTROL BY CATHODIC P TECTION,
E. G. Field
Water and Waste Treatment, Vol 13, No 5, 15, May, 1975. 1 fig, 1 ref

Descriptors: *Corrosion control, Waste w treatment, *Treatment facilities, *Corro *Cathodic protection, Pipelines, Tanks, St tanks, Water analysis

Uses of cathodic protection for corrosion co in various areas of a treatment facility described. Steel which is in contact with neutral electrolyte is almost always subje electro-chemical corrosion. Because curre generated where a difference in potential bet two areas exists, corrosion is instigated at t anodic areas. The most effective way to comp ly inhibit this corrosion is to provide a current so as to prevent dissociation. Cathodic prote has been applied to pipelines laid in soils w other influences enhance the corrosion proble has also been used for buried external surfac storage tanks where coating is difficult. United Kingdom Water Industry has not cathodic protection for inhibiting corrosion o internal surfaces of treatment tanks; in the U States, however, most treatment plants painted and then cathodically protected to ex the length of the coating. Choices of cathodic tection system are sacrificial anode or impre current and may be based on water analysis cluding oxygen content, presence of chloride value, and total dissolved solids; on plant op tion, including temperature and agitated quiescent zones; and, on the history of corro in particular areas of that individual fac (Kramer-FIRL)
W76-00619

SPECIFICATIONS FOR GRANULAR FIL MEDIA,
University Coll., London (England).
K. J. Ives.
Effluent and Water Treatment Journal, Vol 16 6, p 297-305, June, 1975. 7 fig, 1 tab, 8 ref.

Descriptors: *Filtration, *Filters, *Waste w treatment, *Water treatment, Standards, Par shape, Particle size, Sands, Sieves.
Identifiers: Granular filter media specification

The use of coal, pumice, plastics, ceramics, net, ilmenite, alumina, and magnetite as media instead of sand, makes it desirable to pose a British Standard for granular filter m and to agree on methods used for testing media. A basis for a filterability test could be Filterability Number F, which relates head filter rate, average quality of filtrate during ing, quality of influent, and duration of test. lowest value of F represents the best filterab The use of sieves is the most practical grain si technique. Desirable size depends on the cha teristics of the suspension to be filtered. Sieve can be specified by the Hazen effective Shape can be defined in terms of spheri hydraulic diameter divided by sieve size. Sphe ties of less than 0.6 would be unacceptable, s the grains would be too flaky and would sett an unisotropic manner, resulting in rapid clog

nique optimal density exists. The density ld be greater than that of water. An upper ty limit is imposed by the conditions necessa- or backwashing (greater density requires er size). Durability standards should relate to rmance of the saturated media. The media d be whole grains, not cemented ag- erates. Solubility can be specified in terms of lution in acid. Leachate specifications may be l on World Health Organization International lards for Drinking Water. Since surface co-chemical properties cannot be signifi- altered, it is not necessary to formulate fications. Fall velocity does not need to be fied as it depends on the already specified neter of size, shape, and density of the grains. FIRL)
00622

JS-COMPREHENSIVE WATER OURCES MANAGEMENT,
Corp., New York.
rimary bibliographic entry see Field 5G.
00623

RATION OF SEWER AND DRAINAGE EMS (BETRIEB VON KANALISATIONS- ENTWAESSERUNGSANLAGEN),
echen.
nische Mitteilungen, Vol 68, No 5, p 164-166, 1975.

iptors: *Sewers, *Sewerage, *Monitoring, ning, Operation, Maintenance, *Waste water ient, Sewage treatment.
fiers: Television inspection, Sludge collector ts.

onitoring, scavenging, operation, and main- ce of sewer and drainage systems are bed. Sewer systems should be inspected completion and should be regularly if not an- monitored by personal inspection or by as or closed circuit television. Cleaning is ccomplished by means of a high-pressure jet. Sewer connections are scavenged by suction or by emptying the collector ts. It is suggested that sewer sections with le damages be replaced rather than repaired onomic reasons. It was also recommended ll monitoring, cleaning, and maintenance ions should be performed according to a schedule. (Takacs-FIRL)
0626

ON'S CAPITAL FACES CRITICAL ER PROBLEM.
Engineering, ASCE, Vol 45, No 6, p 58-61, 1975. 3 fig, 2 tab.

ptors: *Potable water, *District of Colum- Water quality control, Water distribu- pplied), Water management(Applied), ies, Environmental effects, Treatment es, Costs.
iers: Potomac River, Blue Plains Treatment , Funding, Washington(DC).

erview of problems in water quality in the ngton, D. C. area is presented. In the past years, 14 studies were conducted on how to igh flows for summer use and for flushing tuary, whether or not to build dams and irs to regulate flow, and how to treat the d estuary water of the Potomac River. ms are bureaucratic as well as environmen- e area is owned by four states and the Dis- Columbia, which causes delay in any ad- ative decisions. Dams have been opposed e of land acquisition problems in populated One estuary study is underway, whereby a d demonstration plant will be built at the the Blue Plains Treatment plant to evaluate ssibility of making the polluted estuary potable. While the Blue Plains facility has been expanded and improved in its tertiary stages, the system has had funding problems which have slowed its upgrading. Another new treatment plant that had been scheduled to be built, a 60 to 123 mgd facility in Dickerson, Maryland, has also had funding difficulties and opposition from environmentalists. A pessimistic feeling was stated about the overall progress in public water treatment for the Middle Atlantic Region by the Interstate Commission for the Potomac River Basin. (Kramer-FIRL)
W76-00627

THE FEDERAL CONSTRUCTION GRANT PROCESS FROM A (BILENE) TO Z (ANESVILLE),
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W76-00629

FINLAND'S CLEANUP CAMPAIGN,
For primary bibliographic entry see Field 5G.
W76-00631

LINING OF STORAGE RESERVOIRS AND LAGOONS--THE LATEST TECHNIQUES IN INSTALLATION AND JOINTING,
For primary bibliographic entry see Field 8G.
W76-00632

HIGHER PROFITS VIA ADVANCED INSTRUMENTATION,
Liptak Associates, Stamford, Conn.
B. G. Liptak.
Chemical Engineering, Vol 82, No 13, p 152-158, 160, 162, June 23, 1975. 9 fig, 2 tab, 16 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Control systems, *Instrumentation, Cost-benefit analysis, Costs, Industrial water, Municipal water.
Identifiers: *Advanced control systems.

In most chemical process plants, it is possible to increase production by about 20% by updating the instrumentation. A waste water treatment plant is considered in the example given but the approach used for systems evaluation and cost-benefit analysis can be applied to any other type of plant. Each of the main unit-operations found in a typical industrial or municipal waste water treatment plant is briefly reviewed with respect to instrumentation. The purposes of control systems are described and the traditional methods of instrumentation are compared with the capabilities of more- advanced control systems. Advanced controls include feedforward, multivariable, adaptive or optimizing systems. Before evaluating advanced controls, the conventional loops must be fully utilized. Whenever a new control strategy is suggested, a cost- benefit analysis should be performed. This analysis should identify the economical and other benefits to be gained from the new control system, and in addition should present the associated capital and operating costs. (Orr-FIRL)
W76-00635

DESALTERS SOW SEEDS FOR SAUDI INDUSTRY.
For primary bibliographic entry see Field 3A.
W76-00636

A STRATEGY FOR WATER POLLUTION CONTROL IN BRITAIN,
M. W. Askew.
Water and Pollution Control, Vol 113, No 8, p 16-18, August, 1975. 2 fig, 2 tab, 7 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Water resources, *Administration, *Conferences, Management, Planning, Biological treatment, Tertiary treatment, Water pollution control.
Identifiers: Physico-chemical treatment, *Great Britain.

A synopsis of the Annual Conference of the Institute of Water Pollution Control held at Scarborough, England, is given. This conference provided the first opportunity for a national discussion of the major reorganization of administration of water resources in England and Wales which became effective in April of 1974. The Water Act 1973 transferred the overall responsibilities for water resources to nine regional water authorities in England and a National Water Development Authority in Wales. The first session of the conference discussed corporate management for water authorities. Corporate management was defined as the management organization and structure of an authority necessary fr comprehensive planning and implementation of the use of its resource to achieve its aims. A paper entitled 'Water Resource Planning' identified the role of the water resources planner as developing long-term strategies which would meet multiple objectives at minimal cost. Future prospects of water authorities were dealt with in two papers on 'Operations in Regional Water Authorities, and 'Scientific Services in Regional Water Authorities.' Distinctions were made between physico-chemical treatment of raw sewage and physico-chemical methods for tertiary treatment. Two physico-chemical and biological sewage treatment pilot plants under construction as part of an advanced waste treatment project for NATO were also discussed. (Orr-FIRL)
W76-00638

A HISTORY OF SEWAGE WORKS' MACHINERY,
J. D. Cargill.
Water Pollution Control, Vol 74, No 4, p 430-454. 1975. 9 fig, 127 ref.

Descriptors: *Waste water treatment, *Sewage treatment, Treatment plants, Equipment, Pumps, Screens, Aeration, Sludge treatment, Centrifuges, Filters, Dewatering, History.

A history of the machinery associated with sewage treatment facilities is presented. Since the development of this equipment reflects the development of treatment methods, a review of the developing processes is also presented. The principal methods employed in the nineteenth century were irrigation, filtration and chemical precipitation. Biological processes were developed late in the nineteenth century. By the 1930's, most of the equipment available today had been developed; many improvements have been made during the last forty years. Descriptions are given of machinery that had actually been used in practice from 1840 to mid-1930. Sewage works' machinery can be divided into three broad groups: pumps, screens, detritus removal and scrapers that are used irrespective of the type of treatment; equipment associated with biological processes, such as distributors and aeration equipment; and, the machinery associated with sludge treatment, such as centrifuges, vacuum filters, and filter belt presses. (Orr-FIRL)
W76-00639

A CONTINUOUS GARGANTUAN TASK FOR SEVERN TRENT,
Severn Trent Water Authority (England).
For primary bibliographic entry see Field 5A.
W76-00640

THE EFFECT OF FINITE CHANNEL WIDTH ON CONCENTRATION POLARISATION REVERSE OSMOSIS UNDER LAMINAR FLOW CONDITIONS,
Birmingham Univ. (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3A.

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W76-00642

OTTAWA PLAYS KEY ROLE IN TECHNOLOGY TRANSFER,
Environmental Protection Service, Ottawa, (Ontario).
A. B. Redekopp.
Water and Pollution Control, Vol 113, No 8, p 6, 35, August, 1975.

Descriptors: *Training, *Professional personnel, *Water pollution control, *Canada, Conferences, Waste water treatment, Industrial wastes, Municipal wastes, Treatment facilities.
Identifiers: *Technology transfer.

The development of training packages, courses and seminars for personnel involved in the water pollution control field by the Training and Technology Transfer Division (Water) and the Environmental Protection Service in Canada is described. In the Maritime Provinces, a program for waste water treatment plant operators has been designed to train those plant operators in the field as well as new student operators. The format is an audio-visual unit (Slides and tapes) with a printed workbook. Additionally, three-day operator training programs have been successfully implemented for extended aeration plant (Package plant) operators. For the pulp and paper industry as well as the petroleum refinery industry, special three-day seminars have been conducted. These are designed for regulatory staff employed both federal and provincial governments and discuss the various unit processes involved in the particular industry. Proceedings from the pulp and paper session have already been published and proceedings of the petroleum refinery session are to be published in the next few months. Discussions are related to industrial regulations and guidelines pertaining to current waste water treatment technology. Much emphasis has been placed on these seminars and conferences by the Environmental Protection Service because the individual plant managers in the typical Canadian small industrial operation does not have the time on a weekly basis to study new information. However, most managers do have the opportunity to attend these special seminars to focus on an important area of concern to their specific field of water pollution control. (Kramer-FIRL)
W76-00643

STUDIES ON FLOC-FORMING SUBSTANCES IN ACTIVATED SLUDGE. II. FLOC-FORMING ACTION BY THE VISCOUS SUBSTANCE EXTRACTED FROM ACTIVATED SLUDGE BY ALKALINE SOLUTION. (IN JAPANESE),
Gifu College of Pharmacy, (Japan).
T. Sato, and Y. Ose.
Eisei Kagaku, Journal of Hygienic Chemistry, Vol 21, No 2, p 55-59, 1975. 7 fig, 9 ref.

Descriptors: *Activated sludge, *Flocculation, *Acidity, E coli, Analytical techniques, Separation techniques, *Waste water treatment.
Identifiers: *Floc-forming abilities, Alkaline solution extraction.

An investigation was made on floc-forming substances in activated sludge. Highly viscous substances were extracted from activated sludge 2 N and 0.1 N sodium hydroxide solution. Their abilities to form flocs were observed. Both of these alkaline extracts were seen to flocculate kaolin and E. coli suspensions at a pH below 3, but not near the neutral pH of 7, which is within the flocculating range for activated sludge. Because the substance extracted from activated sludge was insoluble in a strong acidity range, it was postulated that a correlation may exist between acid insolubility and flocculation. (Kramer-FIRL)
W76-00645

ORGANIC RESIDUE IN RECYCLED EFFLUENT, PART II,
Utah State Univ. Logan
V. D. Adams, E. J. Middlebrooks, and P. D. Nance.
Water and Sewage Works, Vol 122, No 7, p 98-99, July, 1975

Descriptors: *Organic compounds, *Chlorination, Analytical techniques, *Water reuse, Effluents, Recycling, Public health, Water pollution sources, Potable water.
Identifiers: Chlorine residual.

There has been much concern abouth the hazard of consuming recycled water because of the chlorinated organic compounds which may be found. An investigation was conducted to study liquids resulting from the use of chlorine as a disinfectant. Although the present study involved reuse of waste water treatment effluents for flushing purposes, and not for human consumption, data should be applicable to other chlorination uses. Material was isolated from recycled effluents by extraction techniques and was found to be a complex mixture, consisting mainly of saturated chlorinated fatty acids. Lipids were present in feces in a quantity significant enough to result in such saturated chlorinated fatty acids, due to a conversion process by free radical chlorination. The rate of accumulation of these chlorinated fatty acids is directly related to the concentrations of lipids added to the system and to the free chlorine maintained in the recycled effluent. Therefore, it is useful to determine the level of organic carbon acceptable in the recycling system so that the bactericidal and virucidal properties of chlorine are not impeded. This will establish a minimum level for acceptable free chlorine residual for the recycled effluent. (Kramer-FIRL)
W76-00646

THE REVOLUTION IN WATER MANAGEMENT,
For primary bibliographic entry see Field 5G.
W76-00648

PILOT PLANT OPTIMIZATION OF PHOSPHORIC ACID RECOVERY PROCESS,
Lancy Labs., Inc., Zelienople, Pa.
L. E. Lancy, F. A. Steward, and J. H. Weet.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-015, April 1975. 27 p, 3 fig, 7 tab, 2 ref. 1BB036;ROAP 21AZO; Task 21, S802637-01.

Descriptors: Industrial wastes, *Waste water treatment, Waste treatment, *Ion exchange, *Water reuse, *Pilot plants, Waste water disposal, Water pollution control.
Identifiers: *Waste recovery, Nonferrous metal industry, Aluminum fabricating wastes, Bright finishing wastes, *Phosphoric acid wastes.

A pilot plant study was carried out which demonstrated the effectiveness and economic feasibility of a unique ion exchange process referred to as 'acid retardation' for purifying spent phosphoric acid used in bright finishing aluminum parts. A continuous ion exchange system was employed to separate the aluminum contamination from a spent phosphoric acid waste obtained from a manufacturing plant. The anion resin accomplishes the separation by retarding the phosphoric acid as the processing solution flows through the bed. The aluminum remains in the waste solution and passes out of the column in the effluent. The acid is then eluted from the bed with water, eliminating the use of chemicals which are needed to regenerate the resin in conventional ion exchange systems. (EPA)
W76-00676

STORM WATER MANAGEMENT MODEL: DISSEMINATION AND USER ASSISTANCE,
University City Science Center, Philadelphia, Pa.
For primary bibliographic entry see Field 5
W76-00678

SPECIFICATIONS FOR MATE
RECOVERED FROM MUNICIPAL REFU
National Center for Resource Recover
Washington D C
H. Alter and W. R. Reeves.
Available from the National Technical I
tion Service, Springfield, Va 22161. Envi
tal Protection Agency, Report EPA-670/2
May 1975. 109 p, 25 tab, 105 ref, append
ROAP 06AKO, Task 02, 801622.

Descriptors: Specifications, Reclamation
wastes, Materials, Municipal wastes, Se
techniques.
Identifiers: Solid waste separation, Refuse
als recovery, Secondary materials, *User
cations, *Materials specifications.

Specifications are presented that represent
forts to define uniform qualities of m
separated from municipal solid waste in r
recovery processing plants for subsequ
and use. The establishment of specificatio
value to outputs and promotes accepta
users as a result of providing a basis for qu
surance. Recoverable materials investiga
folded newsprint and corrugated paper,
metals, aluminum, other nonferrous meta
cullet, inorganic fines, mixed organics (f
Indications of possible contamination w
tained on a limited scale by reviewing lit
visiting plants, and coordinating with the a
of a companion research grant which i
processing pilot quantities of municip
waste from several cities. The resultin
specifications were written as goals fo
design; the targets seem achievable with
technology. The likelihood of these target
cations being accepted was checked by re
them with officials of appropriate compa
trade associations. (EPA)
W76-00684

RAINFALL-RUNOFF RELATIONS ON
AND RURAL AREAS,
Michigan Univ., Ann Arbor. Dept. of C
gineering.
For primary bibliographic entry see Field 2
W76-00685

DISPOSAL AND UTILIZATION OF
KILN DUST FROM CEMENT INDUSTRY
Southern Reserach Inst., Birmingham, Ala
T. A. Davis, and D. B. Hooks.
Available from the National Technical I
tion Service, Springfield, Va 22161. Envi
tal Protection Agency, Report EPA-670/2
May 1975. 54 p, 7 fig, 5 tab, 71 ref, append
EAS-74-237. 1BB036; ROAP 21 BET; Tas
801872.

Descriptors: *Portland cements, Waste d
Dusts, *Waste treatment, Alkali-aggrega
tions, Fertilizers, Industrial wastes, Potass
organic compounds, Air pollution, *Recycl
Identifiers: *Dust control.

A survey that included 60% of the cemen
facturing plants in the United States was
determine the fate of dust collected from th
emanating from cement kilns. Because of
kali content, large quantities of the dust ca
returned to the cement-making process. A
was made of the literature in the United St
Europe pertaining to handling, reclaimi
utilizing the collected dust. Abstracts
references are included in the Appendi
neutralization capacity and potash conte
the dust valuable for application to farmla
the potential market for agricultural us
could consume all of the waste dust that
being discarded. (EPA)
W76-00686

RACTERIZATION AND UTILIZATION OF
ICIPAL AND UTILITY SLUDGES AND
ES, VOLUME I-SUMMARY,
on Univ. Ohio Research Inst.
rimary bibliographic entry see Field 5E.
-00687

RACTERIZATION AND UTILIZATION OF
ICIPAL AND UTILITY SLUDGES AND
ES. VOLUME II - MUNICIPAL SLUDGES,
on Univ. Ohio. Research Inst.
rimary bibliographic entry see Field 5E.
00688

RACTERIZATION AND UTILIZATION OF
ICIPAL AND UTILITY SLUDGES AND
ES, VOLUME III - UTILITY COAL ASH,
on Univ. Ohio. Research Inst.
rimary bibliographic entry see Field 5E.
00689

RACTERIZATION AND UTILIZATION OF
ICIPAL AND UTILITY SLUDGES AND
ES. VOLUME IV - MUNICIPAL INCINERA-
RESIDUES,
on Univ. Ohio. Research Inst.
rimary bibliographic entry see Field 5E.
00690

ERAGE SYSTEM MONITORING AND
OTE CONTROL,
it Metro Water Dept., Mich.
Watt, R. G. Skrentner, and A. C. Davanzo.
able from the National Technical Informa-
Service, Springfield, Va 22161. Environmen-
otection Agency, Report EPA-670/2-75-020,
1975. 183 p, 89 fig, 8 tab, 57 ref, 2 append.
34; ROAP 21-ASY; Task 46. 4-MICH-
20 FAX.

iptors: *Combined sewers, *Monitoring,
ote control, Remote sensing, Telemetry,
ng, Overflows, Sampling, Interception, Data
sition, Cost comparisons, Michigan, *Storm
f, Urban runoff, *Sewerage.
fiers: *Detroit(Mich), *Waste water storage,
oring equipment evaluation, Overflow moni-
, In-system storage, Sewer system opera-

s the final report of a demonstration project
ly sewer system monitoring and remote con-
echniques to reduce pollution of receiving
s from combined sewer overflows and storm
water pumping. The monitoring system in-
telemetering rain gages, sewer level sensors
verflow sensors and a central computer and
ogging facility. Wastewater pump stations
ertain key regulators were remotely con-
to allow in-system storage. Remotely con-
sluice gates were installed in a sewer to
the feasibility of using dry weather flow to
sewers. A detailed discussion and evaluation
cluded of the monitoring and remote control
nent, installation details, the concept of in-
storage, and the operation of the system
on an 18-month study period. Detroit has
that many of the larger sewers are not used
acity during storms. Utilization of system
oring and remote control techniques has
d in a significant reduction in the volume of
ned sewer overflows and storm wastewater
ng as well as reduced operation and main-
e costs. Results of a combined sewer sam-
rogram are being used to establish priorities
ure system modifications. (EPA)
0691

NSTRATED TECHNOLOGY AND
ARCH NEEDS FOR REUSE OF MU-
AL WASTEWATER,
ngineers, Long Beach, Calif.
chmidt, and E. V. Clements, III.

Available from the National Technical Information Service, Springfield, Va. Environmental Protection Agency, Report EPA-670/2-75-038, May 1975. 338 p, 37 fig, 50 tab, 340 ref, 7 append. ROAP 21-ASB - Task 011 1BB033.

Descriptors: *Water reuse, *Waste water treatment, *Municipal water, Water conservation, *Recycling, Sites, Water resources, Cooling water, Water supply, Attitudes, Industrial water, Irrigation.
Identifiers: *Reuse technology, Domestic reuse, Recreation reuse.

This survey identified 358 sites at which direct reuse of municipal wastewater was being practiced. Detailed data were gathered on volume, effluent quality, treatment, reliability and economics. Direct reuse of municipal wastewater was not widespread; it accounted for less than 2 per cent of this nation's water use in 1972. Irrigation and industrial cooling account for virtually all of this reuse. Only three sites practice reuse for recreational lakes, and one for nonpotable domestic use. Potable reuse is not presently practiced. General quality standards could not be derived for any category. In fact, water which is substandard according to published criteria is being successfully used in many reuse situations by fitting the water quality to the specific local condition. Overall economic analysis was also difficult. Storage and distance between supplier and consumer were more important considerations than quality and treatment. In general, the supplier undercharged the consumer because reuse was viewed as an inexpensive disposal technique. There is significant potential for an increase in reuse of wastewater in all categories; increased publicity concerning successful reuse is required to initiate this increase. (EPA)
W76-00692

ADVANCED AUTOMATIC CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE TREATMENT PROCESS,
Systems Control, Inc., Palo Alto, Calif.
J. F. Petersack, and R. G. Smith.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-039. May 1975. 154 p, 33 fig, 11 tab, 14 ref, 3 append. 1BB043; ROAP 21ASC; Task 007 R800356.

Descriptors: *Automatic control, *Waste water treatment, Dissolved gases, Oxygen, Sludge treatment, *Activated sludge, Instrumentation, Computers, Data acquisition, Suspended solids, *California, Sewage treatment.
Identifiers: *Palo Alto(Calif), Badger meter respirometers, Astro ecology TOC analyzer, IBM system/7, Keene suspended solids.

Results of a demonstration of the feasibility and benefits of applying several advanced wastewater treatment control strategies in an operational treatment plant using a digital computer are presented. The work was conducted in a full size (35 MGD capacity) secondary treatment plant at Palo Alto, California. Control strategies tested were for the secondary treatment portion of the process and involved regulation of aeration tank dissolved oxygen (DO) and food for microorganism ratio (F/M). Two variations of F/M ratio control were evaluated using respectively air flow and a direct measurement of sludge respiration with an on-line respirometer to estimate food (BOD). An extensive data collection program was incorporated which allowed detailed statistical evaluation of each control algorithm with regard to performance, effluent quality impact, operating costs, and reliability. Comparison was made to similar data collected during benchmark manual operation tests. Overall results indicate digital control using advanced control concepts is feasible and that demonstrable improvements in effluent quality are obtained. Direct operating cost savings in the form of an 11% reduction in air use was also shown for DO control. (EPA)
W76-00693

BIOLOGICAL TREATMENT OF COMBINED SEWER OVERFLOW AT KENOSHA, WISCONSIN,
Envirex Inc., Milwaukee, Wis.
R. W. Agnew, C. A. Hansen, M. J. Clark, O. F. Nelson, and W. H. Richardson.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-019, April 1975. 246 p, 46 fig, 18 tab, 31 ref, 4 append. 1BB034; ROAP 21-ASY; Task 139 11023 EKC.

Descriptors: *Sewage treatment, *Waste water treatment, Activated sludge, Runoff, *Biological treatment, Overflows, *Wisconsin, *Combined sewers, Water pollution, *Surface runoff.
Identifiers: *Contact stabilization, *Kenosha(Wis), Dual use, Dry/wet weather treatment, Combined sewage, Combined sewer overflow.

A description is presented for the design, construction, operation and two-year evaluation of a biological process used for the treatment of potential combined sewer overflow. A 75,700 cu m/day (20 mgd) modified contact stabilization process was constructed on the grounds of an existing 87,055 cu m/day (23 mgd) conventional activated sludge plant at a total cost of 1.1 million dollars. The demonstration system consisted of pumping facilities, the conversion of an unused flocculation basin into a grit basin, construction of a contact tank and stabilization tank, installation of a final clarifier and all associated yard piping and automatic control equipment. The demonstration system's raw sewage pump and clarifier were used by the dry weather plant when the demonstration system was not in use. Results from the evaluation program proved the demonstration system to be a feasible concept for the treatment of potential combined sewer overflow. The system was operated and evaluated during 49 runs in which 681,300 cu m (180,000,000 gal.) of potential overflow was treated. Based on these tests, expected removal efficiencies for suspended solids, BOD, and TOC are 90%, 85%, and 76%, respectively. Operating costs for running the system 300 hours per year are estimated at 3.567cents/cu m (13.5cents/1000 gal.). An additional benefit derived from the demonstration system was improved removal efficiencies by the dry weather plant through utilization of the demonstration system facilities. (EPA)
W76-00694

URBAN STORMWATER MANAGEMENT MODELING AND DECISION-MAKING,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney, W. C. Huber, H. Sheikh, M. A. Medina, and J. R. Doyle.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-022, May 1975. 185 p, 37 fig, 47 tab, 95 ref. 1BB034 ROAP:ATA Task:015 802219 (11023 GSC).

Descriptors: Water storage, Simulation analysis, Rainfall, Runoff, Vegetation, Waste treatmen, Erosion control, Optimization, Cost analysis, *Combined sewers, *Water pollution, Computer programs, Decision making, *Computer models, *Storm drains, *Storm water, *Cost sharing.
Identifiers: Lancaster(Pa), *Urban stormwater management model.

The purposes were to test, refine and augment the capabilities of the EPA Storm Water Management Model (SWMM), and to develop decision-making capabilities for use in the study of urban stormwater runoff problems. With regard to the SWMM the numerous programming refinements were introduced to provide reliability and flexibility. A sediment prediction capability has been incor-

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porated directly into the SWMM. Detailed testing was conducted in Lancaster, Pennsylvania to demonstrate the ability of the SWMM to describe the relatively complex phenomena occurring in an urban catchment. A systematic procedure is presented for examining the stormwater management problem in the broader context of urban water resources management. Related standards for flood control and drainage, street and parking lot design, etc., are reviewed and suggestions presented regarding modifications in practices which would ameliorate stormwater problems. An optimization procedure is described which addresses the related problems of finding efficient and equitable control strategies. Lastly, the use of the SWMM for preliminary hydraulic design of sewer systems is described. (EPA)
W76-00695

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTE WATER TREATMENT IN CHLOR-ALKALI PRODUCTION,
Houston Univ., Tex. Dept. of Quantitative Management Science.
F. D. Singleton, Jr., J. A. Calloway, and R. G. Thompson.
Water Resources Research, Vol 11, No 4, p 515-525, August, 1975. 11 fig, 4 tab, 22 ref.

Descriptors: *Waste water treatment, *Costs, *Water quality standards, *Industrial plants, Water pollution, Waste water(Pollution), Model studies, Economics, Water treatment, Water quality control, Water utilization, Chlorine, Mercury.
Identifiers: Mercury cell plants, Diaphram cell plants, *Chlor-Alkali production.

An economic evaluation was made of the effects of increasingly restrictive waste water effluent standards and higher costs of water withdrawals on resource use, waste discharges, and costs of producing chlorine and caustic. Mercury and diaphragm cell methods of production were studied for large modern plants at the design stage. Zero discharges of total solids increased production costs 5.6% in diaphragm cell plants and 12.1% in mercury cell plants. Zero discharge restrictions of mercury may only be accomplished by use of diaphragm cells. (Robinett-Arizona)
W76-00707

ANIMAL WASTE MANAGEMENT WITH POLLUTION CONTROL.
For primary bibliographic entry see Field 5G.
W76-00714

NITRIFICATION RATE IN BIOLOGICAL PROCESSES,
Metcalf and Eddy, Inc., Boston, Mass.
C. S. Huang, and N. E. Hopson.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE2, p 409-422, April, 1974. 3 fig, 78 ref, 2 append.

Descriptors: *Nitrification, Rates, Sanitary engineering, Biological properties, Laboratory tests, Reviews, Bibliographies.
Identifiers: *Reaction rate equation.

A review of literature concerning the nitrification process shows a diverse opinion as to the reaction rate equation for the process. Four reaction rate equations are reviewed and an experimental study performed to determine the correct equation is described. From the initial ammonia nitrogen concentration and the contact time studies the nitrification process was shown to follow a zero-ordered reaction. This conclusion is in disagreement with some of the reviewed literature. However, many experimental and evaluation problems may cause researchers to assume first-order reaction rates in their nitrification studies. The expression 'percent removal' or 'percent remaining' usually used in BOD reactions is not a meaningful way to evaluate the reaction rate. A small change in pH caused by the H+ ions released from the nitrification process also may affect the results of nitrification studies (Skogerboe-Colorado State)
W76-00738

WATER AND ENERGY REQUIRED TO OPERATE COAL GASIFICATION FACILITIES AND WASTE WATER TREATMENT REQUIREMENTS,
El Paso Natural Gas Co., Tex.
For primary bibliographic entry see Field 6D.
W76-00751

ADVANCED PROCESSES: WATER DESALTING AND REUSE,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
R. A. Sierka.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 206-230. 3 fig, 6 tab, 12 ref.

Descriptors: *Waste water treatment, *Recycling, *Water reuse, *Desalination, *Water quality, *Biological treatment, Coagulation, Filtration, Flocculation, Oxidation, Reverse osmosis, Activated carbon, Industrial wastes, Municipal wastes, Semipermeable membranes, Waste water(Pollution), Water pollution, Water treatment, Sewage treatment, Tertiary treatment, Water conservation, Electrochemistry, Water chemistry, Inorganic compounds, Organic compounds, Nutrients, Suspended solids, Ozone, Chlorination, Ion exchange, Economics.

To upgrade polluted water to a quality level demanded by a potential user requires various degrees of treatment including the use of advanced treatment processes either singly or in combination. Process sequencing is of prime importance since the system's optimization often depends on previous pollutant removals. Described are advanced treatment processes for the 5 pollutant categories: (1) dissolved inorganics, (2) dissolved organics, (3) nutrient species, (4) suspended particulates, and (5) living matter. Reverse oxmosis or electrodialysis is used for (1, activated carbon adsorption, oxidation with ozone, or wet air oxidation for (2), coagulation and flocculation with metal coagulants with biological cellular uptake for phosphorous, or air stripping, ion exchange, breakpoint chlorination, and nitrification-denitrification for nitrogen removal for (3), straining, gravity separation, and granular media filtration for (4), and chlorination, ozonation, heat, and gamma radiation for (5). These operations can be synthesized into a process to produce renovated waters for reuse at any given quality level. Proper operation sequencing with single and multiple pollutant removal capabilities will provide an optimum design for both the economic and process standpoint. (See also W76-00745) (Robinett-Arizona)
W76-00756

POTENTIAL FOR AGRICULTURE UTILIZING WASTE HEAT FROM POWER PLANTS,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 3C.
W76-00757

CITY WASTE WATER REUSE FOR NUCLEAR POWER PLANT COOLING,
Arizona Public Service Corp., Phoenix.
A. C. Rogers.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 304-319. 5 fig, 5 ref.

Descriptors: *Water supply, *Water requirements, *Nuclear powerplants, *Waste water treatment, *Water reuse, Water utilization, Lime, P power production, Water resources, Econ Costs, Electric power, Energy, Cooling, Cooling towers, Arid lands, *Arizona, Wate servation, Recycling, Water quality, Bio treatment, Chlorination, Water treatment, tion, Calcium compounds, Magnesium pounds, Silica, Phosphates, Ammonia, Ni tion.
Identifiers: Phoenix(Ariz), Cold lime treatm

In using waste water for nuclear power plan ing it is important to maintain calcium, ma um, silica and phosphate at low levels fo condenser/cooling tower operation. A reduc ammonia is important because of potential sion of certain metal alloys and for reliabili cost effectiveness of the overall waste wate mation system. The effluent requires chlorination initially, a treatment step com biological nitrification to remove most of t monia, then a one or two stage cold lime ment. The two-stage lime treatment proce lime addition in the first clarifier at a high remove phosphate and calcium through for of calcium hydroxyapatite. This treatmen removes magnesium and silica. In the stage, the pH is lowered through the addi CO2, and soda ash which results in remo reasonably pure calsium carbonate which recovered to supplement the lime additio cost of the water after processing is estim be in excess of $100 per acre-foot. (See als 00745) (Robinett-Arizona)
W76-00760

ENVIRONMENTAL COSTS FOR THE NA GENERATING STATION,
Salt River Project, Phoenix, Ariz.
G. E. Palomino.
In: Conference on Water Requirements for Colorado River Basin Energy Needs, Ma 1975. p 320-344, 6 fig.

Descriptors: *Water quality, *Water *Environmental effects, *Air pollution, E power production, Waste water trea Recycling, Industrial wastes, water(Pollution), Water pollution, Water ment, *Airzona, Water conservation, Water requirements, Water supply, Arid Ecology, Electric power industry, Water tion, Environmental engineering, Coals, S Esthetics.
Identifiers: Brine concentrator, Powell(Ariz), Environmental constraints, N Generating Station(Ariz), Vertical tube ev tor.

The cost estimate for the 2,250,000 kilowat fired Navajo Generating Station, locate Page, Arizona, now exceeds 650 million d When the project was implemented, enviro tal design criteria were developed for 3 areas of concern: air quality, water qualit aesthetic considerations. Air quality protect cludes NO sub x control, a particulate re system, an ash handling system, a fly ash s a coal handling system (which incorporate suppression systems,coal conveyars sures,and a dust collection system) and removal system. Water for the plant come Lake Powell and none is returned. All plant water is disposed of by discharge to essentia permeable evaporation ponds. A sanitary system for collection of oily wastes, s drainage, and equipment drainage along water reclamation system has been installed plant. The reclamation system is a vertica evaporator which treats some of the cooling blowdown and can reclaim up to 90% of the The most important impact of aesthetic con tion was on the design and construction Lake Powell pumping station. (See also 00745) (Robinett-Arizona)
W76-00761

VELOPMENT OF SEWER SYSTEMS.
an Environment Agency, Tokyo.
Water Pollution Control in Japan, p 32-33, May
2. 1 tab.

scriptors: *Sewerage, Drainage area, Legisla-
, Construction, Waste water treatment.
ntifiers: *Japan.

of the end of fiscal year 1970 the rate of
erage of Japan's sewerage systems in terms of
nage area was only 22.8%. Due to the
blishment of the 1970 environmental standards
the enforcement of a new City Planning Law,
need for accelerated construction of sewer
ems necessitated a third five-year sewerage
struction program formulated with an esti-
ed total for the extension of sewer systems
ting in fiscal year 1971. The drainage areas of
er systems is scheduled to reach 38% of the
urban area by the end of this program.
doski-FIRL)
-00762

CKHOLM THROUGH THE EYES OF THE
ERAGE ENGINEER,
kholm Gas and Water-Works, (Sweden).
Vatten, Avlopp Water, Sewage Eau, Egouts, p
7, 1972.

riptors: *Sewerage, *Sewers, *Treatment
ties, Sewage disposal, Sewage treatment,
lation, Waste water treatment.
tifiers: *Stockholm, *Sweden.

resent the number of persons being serviced
ockholm's sewage treatment facilities is more
900,000 with an estimated one hundred
and increase by the year 2000. The com-
-type sewerage system for the area dates
1868 and is the mainstay for the district.
the mid-1950's the sewers have been con-
ted on the duplicate or separate system and
ged so that the sewage runs under gravity in
rection of the nearest lake. With the need for
ge treatment and the extension of populated
, intercepting sewers were constructed and
umping of sewage on a large scale initiated.
there are approximately 130 sewage pump-
tations within the confines of the city.
oski-FIRL)
0763

INUOUS READING LOW RANGE TUR-
IETER MODEL 1720.
imary bibliographic entry see Field 7B.
0764

DRATION OF URBAN SEWAGE SLUDGE
REEZING (TOSHI GENSUI ODEI NO
TSU DASSUI SHORI),
ion Center of Osaka Prefecture, Osaka
). Research Inst.
sumura, Y. Kinugasa, and I. Toda.
Shori Gijutsu, (Water Purification and
Wastes Treatment), Vol 13, No 5, p 1-6,
972. 8 fig, 4 tab, 2 ref.

ptors: *Sewage sludge, *Sewage treatment,
ing, *Dehydration, Sludge treatment,
water treatment.
iers: *Japan(Osaka), *Freezing-dehydration
, Precipitation pond, Precipitation speed.

plication of a freezing-dehydration system
in treating urban sewage sludge has been
in Japan. Samples from the Osaka sewage
nt plant were categorized as sludge from
ial precipitation pond, one-hour condensa-
cess sludge, and mixed sludge. Results
at the precipitation speed of sludge was in-
greatly by this freezing-melting method.
ecipitation speed of excess and mixed
did not change with freezing speeds; how-
he initial precipitation pond sampling reacted more effectively under slower speeds. The feasibility of such a treatment system for urban use presently is outlawed to costs unless natural freeze and an effective use of liquid-gas gasification heat are employed. (Sandoski-FIRL)
W76-00765

DESIGN CRITERIA--WASTE TREATMENT PLANTS AND TREATMENT OF SEWER OVERFLOW,
Environmental Protection Agency, Springfield, Ill.
W. L. Blaser.
Water Pollution Control Technical Policy 20-24, Illinois Environmental Protection Agency, Sanitary Water Board, July, 1971. 25 p, 1 fig, 2 tab.

Descriptors: *Legislation, *Overflow, *Sewers, Sewerage, *Treatment facilities, Combined sewers, Infiltration, *Design criteria, Separated sewers, *Waste water treatment, *Illinois.

Pursuant to authority granted in Section 39 of the Environmental Protection Act and in the Illinois Pollution Control Board Rules and Regulations the design criteria in the treatment of sewer overflows must meet the following requirements. All system bypasses and overflows that are not absolutely necessary shall be eliminated or alternate facilities provided to insure adequate treatment of the overflows. New combined sewers are prohibited and existing combined sewer systems shall be controlled with overflow regulating devices adjusted to convey the maximum amount of combined flow to the treatment facilities. All infiltration to the sewer system shall be controlled to keep dry weather flow at design limits. (Sandoski-FIRL)
W76-00769

SEWAGE PURIFICATION DEVICE (OSUI JOKA SOCHI),
K. Kuramoto, K. Yoshimura, Y. Hirakawa, and H. Matsumoto.
Japanese Patent Sho 47-12392. Applied March 29, 1967. Issued April 17, 1972.

Descriptors: *Sewage treatment, *Treatment facilities, *Patents, Aeration, Aerobic conditions, Chemical precipitation, Disinfection, *Aerobic treatment, *Waste water treatment.
Identifiers: Japan, *Aerobic digestion.

A sewage purification system consisting of an aeration tank, two precipitation tanks, an aerobic digestion tank, and a sterilization tank has been patented. One large outer tank is separated into two sections by a partition. One section is segmented further into two sections by double walls which do not cut off the two segments completely. One is the aeration tank, and the excess sludge from this part over- flows into the next section when it gets above a certain level; the connecting section is a precipitation tank. When the water level of the supernatant liquid from the second precipitation tank rises above a certain level, it overflows into the sterilization tank. By transferring excess sludge from the aeration tank into its precipitation tank, the sludge concentration of the aeration tank is always maintained at a given level, preventing any lowering of aeration tank functioning. (Sandoski-FIRL)
W76-00770

SEWAGE SOLID SEPARATING DEVICE,
C. C. Laval, Jr.
Untied States Patent 3,701,425. Applied October 16, 1970. Issued October 31, 1972. Official Gazette of the United States Patent Office, Vol 903, No 5, p 1582, October 31, 1972.

Descriptors: *Sewage, *Solid wastes, *Separation techniques, Flow characteristics, *Patents, Equipment, *Waste water treatment.
Identifiers: Sewage solids, Sewage fluids.

A device for separating sewage solids from sewage fluids has been patented. The device is characterized by a variably dimensioned orifice for tangentially jetting a stream of fluid into a vortexing chamber supported in an upwardly spaced relationship with an accumulator for descending solids. A flexible closure member is extended across the orifice in the direction of the flow and is provided with a first surface against which fluids passing through the orifice impinge and a second surface against which fluids within the chamber impinge, whereby the effective dimensions of the orifice is varied in response to variations in the flow characteristics of the stream. (Sandoski-FIRL)
W76-00771

COMPACT SEWAGE TREATMENT APPARATUS,
R. D. Wetzel.
United States Patent 3,701,426. Applied November 18, 1971. Issued October 31, 1972. Official Gazette of the United States Patent Office, Vol 903, No 5, p 1582, October 31, 1972.

Descriptors: *Sewage treatment, Anaerobic bacteria, Sedimentation, Flotation, Filtration, Effluents, *Patents, *Waste water treatment.

A patent for a compact, compartmentalized sewage treatment apparatus housed in a single tank has been issued. Sewage discharged into the apparatus is progressively clarified byanaerobic bacterial deomposition, primary sedimentation and flotation, chemical attack to reduce coliform bacteria and BOD, and secondary sedimentation, flotation and filtration to highly clarify the effluent for discharge into water courses. (Sandoski-FIRL)
W76-00772

PROCESS AND PLANT FOR TREATING SEWAGE AND THE LIKE,
K. C. Ayers, and D. W. McAnaney.
Canadian Patent 912,716. Applied April 30, 1970. Issued October 17, 1972. Patent Office Record, Vol 100, No 42, p 4379, October 17, 1972.

Descriptors: *Sewage, Trickling filters, Lagoons, *Patents, *Sewage treatment, Dissolved solids, Suspended solids, Activated sludge, *Waste water treatment.

A process for the treatment of liquid containing biodegradable organic solids, as for example sewage, which combines desirable features of trickling filter and activated sludge systems and includes suitable apparatus has been patented. In this process, a liquid containing biodegradable solids is constantly recirculated from a sump or aerobic lagoon through a trickling filter, and effluent from the trickling filter is mixed with incoming raw sewage with agitation in the sump. The mixture is then retained in quiescent zones before overflow effluent is removed from the sump thus efficiently treating both settleable solids and dissolved solids contained in the sewage. (Sandoski-FIRL)
W76-00774

RATIONAL FORMULA NEEDS CHANGE AND UNIFORMITY IN PRACTICAL APPLICATION,
For primary bibliographic entry see Field 4A.
W76-00775

32-FOOT VERTICAL SHAFT BUILT WITH CONCRETE PIPE.
For primary bibliographic entry see Field 8G.
W76-00776

PENYBONT MAIN SEWER.
Civil Engineering and Public Works Review, Vol 67, No 796, p 1185, November, 1972. 1 fig.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Descriptors: *Sewerage, *Treatment facilities, Aeration, Population, Overflow, Flow, Settling basins, Waste water treatment.
Identifiers: Penybont(England), Storm water tanks.

The main units of treatment of the new Penybont, England sewer system include the main pumping station, the grit extraction and macerating plant, primary sedimentation tanks, the aeration system, secondary sedimentation tanks, and storm water tanks. The ultimate design population will be in the region of 180,000 persons with an anticipated trade flow in the order of 5.5 mgd. The peak design flow is anticipated to amount to approximately 108 mgd, and the storm separation device has been designed to accomodate varying overflow settings as development takes place. (Sandoski-FIRL)
W76-00777

TUNNELING MAKES RIVERSIDE INTERCEPTOR FEASIBLE,
Black and Veatch, Kansas City, Mo.
W. R. Condon.
Public Works, Vol 103, No 11, p 70-72, 104, November, 1972. 3 fig.

Descriptors: *Tunneling, *Sewers, *Interceptor sewers, Drainage water, Construction methods, Soils, Dewatering, Missouri River, Treatment facilities, Tunneling, *Missouri.
Identifiers: *St. Joseph(Mo).

A riverside interceptor sewer, which parallels the Missouri River near the outlet of existing combined sewers, for the collection and treatment of dry-weather waste water flow was constructed in St. Joseph, Missouri. In this interceptor system the dry-weather flow in the sewers is intercepted and conveyed to a treatment plant. Tunneling was used in the interceptor program in conjunction with the wood box construction method. With this type of construction, a shaft is built at each turning point in the sewer alignment, at each line manhole, and at each diversion structure. A tunneling shield is lowered into a shaft and used to excavate along the sewer alignment. Much of the soil was accreted and contained a variety of materials, including sand, clay, gumbo, and trash, loose rock and wood. A portion of the sewer was constructed in sand below the level of the Missouri River, and extensive dewatering was required. (Sandoski-FIRL)
W76-00778

MOLE MUNCHES THROUGH 4 MILES OF HARD ROCK.
Engineering News Record, Vol 189, No 17, p 18-19, October 26, 1972. 3 fig.

Descriptors: *Tunnels, *Tunneling, Treatment facilities, Tunneling machines, New York.
Identifiers: New York City, North River Pollution Control Project(NY).

The New York City River Water Pollution Control Project includes 13 miles of tunnels with five tunnel sections, and a 220 mgd treatment plant. Tunneling methods include the conventional shoot and muck, cut and cover, tunnel boring machines (TBMs), working under air, freezing, and combinations of these. Two TBM moles are being used on the Project: one, an 11-foot diameter mole in the south heading of a four mile tunnel; and the other, an 8.5-foot diameter mole in the north heading. The moles cut through the rock with strengths to 30,000 psi. The gage cutter with a 1-inch round bolt carbide insert provides endurance, lasting through 1000 feet. The bolt inserts are placed around the outside of the cutter head. Cutter disks with button carbide inserts are placed around the center of the cutter head. The smooth finish climinates the need to concrete overbreak areas. (Sandoski-FIRL)
W76-00779

LOADER USED TO SPEED SEWER TUNNEL CONSTRUCTION.
Tunnels and Tunnelling, Vol 4, No 6, p 560, November/December, 1972. 2 fig.

Descriptors: *Tunnel construction, *Tunnels, Tunneling machines, Sewers, *Ohio.
Identifiers: Lucas County(Ohio).

A small four wheel drive skid-steer type Uniloader with a water-cooled diesel engine was used to speed sewer tunnel construction in Lucas County, Ohio. The old fashioned method of tunnel construction was used, the procedure consisting of drilling, shooting, mucking, and installing steel support rims and wooden lagging. Several modifications were made to better equip the Uni-loader for tunneling. A shovel point nose was fabricated onto a conventional bucket since a small loader pushing a standard half-yard bucket into heavy shot rock could be expected to have problems. A special steel box was rigged to the rear of the machine and loaded with 150 pounds of lead for extra counter weight. The air cleaner was replaced with an oil bath cleaner because of the dirty underground conditions. The diesel engine was equipped with a special scrubber-type catalytic muffler designed to reduce the amount of noxious gases emitted. The Uni-loader was used to carry rock, dynamite, drills, steel ribs and laggings, and concrete for the construction of a floor to maintain the pipeline at grade. (Sandoski-FIRL)
W76-00780

MINI TUNNELLING SYSTEM.
For primary bibliographic entry see Field 8H.
W76-00782

A GENERAL PLAN FOR THE URBAN DEVELOPMENT OF MOSCOW AND TASKS RELATED TO WATER HYGIENE AND SANITARY PROTECTION OF WATER RESERVOIRS (GENERAL' NYY PLAN RAZVITIYA MOSKVY I ZADACHI GIGIYENY VODY I SANITARNOY OKHRANY VOKOYEMOV),
S. H. Cherkinskiy.
Gigiyena i Sanitariya, Vol 37, No 16, p 16-20, 1972.

Descriptors: *Water supply, *Water reuse, Sewerage, *Waste water treatment, Reservoirs, Runoff, Aeration, Construction.
Identifiers: Moscow, U.S.S.R., Vazuza River.

Extensions and implementations are planned for the water supply and sewer system of Moscow to provide for the increasing population and water resource deficit. A 2% increase of water supply is anticipated for the coming years. The daily water supply is projected at 4.4 million cubic meters in 1975, 5.3 million in 1985, and 7 million by 2000, with 30% assigned for industrial and air conditioning purposes. Industries will be forced to focus on developing water recycling methods. A new water reservoir is under construction on the Vazuaz River and is expected to provide 1.7 million cubic meters of water daily. To prevent contamination of the surface reservoirs within the metropolitan area, the separate canal networks will be converted into a unitary system handling both the sewage and runoff waters; an aeration system with a daily capacity of one million cubic meters will also be provided. (Sandoski-FIRL)
W76-00783

ADVANCES IN WASTEWATER TREATMENT IN MELBOURNE: SOUTH EASTERN SYSTEM,
Caldwell Connell Engineers, Melbourne (Australia).
R. C. Aberley, and A. W. Bird.
Water and Sewage Works, Vol 119, No 11, p 80-89, November, 1972. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Sewers, Sewerage, Population, Interceptor sewers, Outfall sewers, *Australia.
Identifiers: Melbourne(Australia).

The South Eastern Sewerage System for bourne, Australia, projected for completi 1975, will intercept waste water from Melbou eastern, northeastern, and southeastern sul and convey it to a new treatment plant. The sy will cost $180 million and will provide general a population in excess of 1.5 million, when developed it will provide for about 3.5 m population. The system consists of four majo ments: intercepting and trunk sewers, pur stations, the purification plant, and an ef outfall sewer. Designs for pre-treatment, pr and secondary treatment, solids treatmen disposal, process control, and auxiliary and p systems and personnel requirements have developed. (Sandoski-FIRL)
W76-00784

WASTEWATER TREATMENT IN A PRES PIPE,
Irvine Ranch Water District, Calif.
R. Stoyer, and J. Scherfig.
The American City, Vol 87, No 10, p 84, 86, 9 October, 1972. 2 fig, 2 tab, 1 ref.

Descriptors: *Waste water treatment, *Pipe Biological treatment, Biochemical oxyge mand, Activated sludge, Water reuse, Aerati
Identifiers: Pressure pipe treatment, A sludge.

Waste water treatment within a pressure p shows promise of producing better than 90% removals, with costs at 40% less than a c tional secondary treatment and recla system. The pressure pipe treatment (PPT) provides both transportation and treatment pipeline used to deliver the reclaimed water point of reuse. Biological treatment occurs pipeline by a modification of the conventio tivated sludge process. The introduction of pure oxygen in the pipeline maintains the ne ry dissolved oxygen for the process. Ac sludge, removed at the upstream end pipeline, returns to the downstream and sewer. The system is composed of influen works, primary sludge separation, an sludge activator, a wet well, an air compre PPT pipeline, a sludge removal process processing, and reclaimed water distri (Sandoski-FIRL)
W76-00785

TREATED SEWAGE FOR POWER MAKEUP WATER,
R. Dvorn, and R. Wilcox.
Power Engineering, Vol 76, No 11, p November, 1972. 2 fig.

Descriptors: *Waste water treatment, *Tre facilities, *Sewage treatment, Tertiary tre Waste reuse, Cooling towers, Boiler feed Activated sludge, Phosphates, Biochemi ygen demand, Suspended solids, Lime.
Identifiers: Alum.

Effluent from the secondary stage of m sewage treatment plant is amenable to treatment to fit it for use as a power plant m water. The majority of make-up water is u cooling towers and boiler feed. The se treatment stage of the sewage plant is a sludge. Its effluent is pumped to a Gravier at a rate of 3000 gpm where phosphates, BO suspended solids are reduced to .ow valu incoming flow passes through a flash mix tion where it is mixed with lime and alum rate of 2.0 pounds lime and 0.25 pounds a 1000 gallons of water. (Sandoski-FIRL)
W76-00786

CONSTRUCTION AND EQUIPMEN SEWAGE PLANTS, NEW TENDENCIES FIELD OF CONSTRUCTION AND EQUI

SEWAGE PLANTS (BAU UND SRUESTUNG VON ABWASSERANLAGEN),
Kuntze.
hnique Mitteilungen, Vol 65, No 9, p 409-412, tember, 1972.

criptors: *Treatment facilities, *Waste water tment, *Sewerage, Construction costs, Auto- ion, Control systems, Data processing, Ru- f.
ntifiers: West Germany, Pressure drainage, cum drainage.

il recently, gravity has been used as the only rce of energy for collection and transport of age waste water in Germany thus offering nical solutions for determining construction ciples for city sewer networks and hydraulic city limitations. In view of high costs for the struction of sewer systems, methods must be eloped for better utilization of present capaci- Electronic network plan computation permits determination of a sewer system's compound ct as a prerequisite to the use of available city by suited regulation systems. In the city Hamburg, such a control system is being real- . As a first step teleprinting rain gauge and printing depth indicators in the sewer have n installed. The most favorable runoff condi- s of the system are computed by electronic processing. Two new methods have been eloped to aid improvement, those being pres- drainage and vaccum drainage. (Sandoski- L)
5-00787

LE-UP AND PROCESS DESIGN CHNIQUES FOR FIXED FILM BIOLOGICAL ACTIONS,
rk, Lawler and Matusky, New York.
. Quirk.
er Research, Vol 6, No 11, p 1333-1360, ember, 1972. 20 fig, 4 tab, 3 ref.

criptors: *Model studies, *Waste water treat- t, *Biological treatment, Computer programs, hemical oxygen demand, Sewage, Effluents.
ntifiers: Bio-oxidation, Biological film.

oretical models for bio-oxidation using a sheet reactor with a fixed biological film similar to used in a trickling filter were developed. The els assumed plug flow hydraulics and accept erous assumptions for BOD removal kinetics uding: zero order, first orderk Michaelis-Men- and retardant mechanisms. Systems models constructed incorporating hydraulics, tics and film geometry and results arranged grahically into linear expressions which allow hical determination of the rate constants from of experimental data. Application of the retical model is verified using operating data laboratory studies of municipal sewage, kraft effluent, sulfite mill effluent, hard-board mill ent, and yeast fermentation effluents. BOD entrations examined varied from 200 to 600 0.1 pH changes from 4.5 to 9.8 were evaluated. perature varied from 15 to 30C in a series of rolled experiments. Computer programs were loped to accept performance data and to per- the following functions: rearrange units of cession; compute correlation parameters; tabu- all data, graphically array correlations, and to pute model rate constants. Scale-up calcula- and verification of the scale-up technique are ented to allow application of laboratory rate tants to determine the prototype rate constant specific film geometry. (Sandoski-FIRL)
-00788

TO MUNICIPALITIES FOR WATER PLY, POLLUTION ABATEMENT AND ER SEPARATIONS.
primary bibliographic entry see Field 6E.
-00789

WASTE DISPOSAL METHOD,
T. A. Nevin, and D. D. Woodbridge.
Canadian Patent 914,810. Applied September 3, 1969. Issued November 14, 1972. Patent Office Record, Vol 100, No 46, p 4774, November 14, 1972.

Descriptors: *Waste water treatment, Effluents, *Water reuse, Water supply, Sewage, Sewage treatment, Slurries, Sludge, *Patents, Waste disposal.
Identifiers: Ammonia removal, Methane removal, Lipid removal.

A patent has been assigned to Energy Systems, Incorporated of Melbourne, Florida for a waste treatment method of sewage and other liquid wastes in which the final effluent is adaptable for immediate reuse in a water supply system. Raw sewage is screened and the grit removed prior to mixing the sewage into a more uniform slurry. The slurry is processed to remove ammonia, methane, and acid insoluble lipids. The defatted, methane free slurry then has the sludge concentrated for further processing, soil enrichment or burning while the effluent is paaed through a series of different processes for removing various harmful or useful materials. This series of processes significantly includes the adapting of chemostats for usage in water treatment. Finally the effluent is prefiltered, passed through a radiation sterilizer, then a polishing filter, for reuse in a water supply system. (Sandoski-FIRL)
W76-00790

ROCHESTER'S STORMWATER DRAINAGE,
Humphreys (Howard) and Sons, London (England).
A. J. Ross-Smith.
Surveyor, Vol 140, No 4201, p 26-29, December 15, 1972. 6 fig.

Descriptors: *Floods, *Sewerage, *Sewers, Runoff, Drainage systems, Separated sewers, Infiltration, Flood control, Surface drainage, Urban runoff, Waste water treatment.
Identifiers: Rochester, England, Medway River.

The established city of Rochester, England is divided by the River Medway into two drainage areas which have been subjected to periodic flooding. In more recently developed areas, drainage is on the separate system yet during storms excess runoff infiltrates the older parts of the city causing flooding in low-lying areas. To alleviate this constant problem, the city council in 1963 financed a report on the city's surface water drainage system including necessary works to prevent flooding. It was recommended that a separate surface water system supplement or replace the existing sewers. As total redevelopment takes place over the years, the existing partially separate system will be replaced by completely separate sanitary and surface water sewers. (Sandoski-FIRL)
W76-00791

OAKLAND MAPS PROGRAM TO COMBAT SEWER INFILTRATION,
California State Dept. of Public Works, Oakland.
J. E. McCarty.
Public Works, Vol 104, No 2, p 82-83, February, 1973. 3 fig.

Descriptors: *Sewers, *Maps, *Maintenance, Cleaning, Equipment, Maintenance costs, Infiltration, *California, Waste water treatment.
Identifiers: *Oakland(Calif), *Sewer surveillance maps.

Development of a sewer surveillance map procedure and a preventive maintenance program based on use of modern sewer cleaning equipment have cut the sewer cleaning call rate from 50 to three calls per week in the northeast sector of Oakland, California. Using city maps for this program, every main is plotted, numbered, and scheduled for cleaning at least once a year. In areas where eucalyptus trees abound, which cause 90 percent of the stoppages, two cleanings per year are scheduled. In addition to mechanical and hydraulic cleaning, the area is chemically treated once a year by a flood and hold method applied one month prior to the scheduled rodding. The control reports coupled with the surveillance maps indicate that maintenance costs average 4.5 cents per foot of sewer. (Sandosli-FIRL)
W76-00792

NOMOGRAMS FOR SEARCH OF SYMBOLS PU AND TU OF STORM OVERFLOW IN A MIXING CONDUIT (NOMOGRAMME ZUR EMITTLUNG VON PU UND TU EINES RECENUEBERLAUFS DES MISCHWASSERKANALS),
H. Sold.
Wasser und Boden, Vol 24, No 9, p 312-315, 1972. 4 fig, 3 ref.

Descriptors: *Sewerage, Combined sewers, *Storm runoff, Water levels.
Identifiers: *Nomograms, West Germany, *Storm overflows.

Nomograms for searching optimum values of the water level, tu, and have weir crest height, pu, for the end of storm overflows in mixed sewer systems have been developed according to the preliminary guidelines of the West Germany Waste Water Association. The nomograms were elaborated for one storm overflow length, seven flow reducer section dimensions, eight reducer section slopes, and one pipe surface roughness. Optimum values of tu and pu, of the load capacity of the reducer section, the reducer diameter, bed slope, and of the storm overflow length are found in the nomogram as a function of the acceptable overload caused by the storm runoff in the outgoing sewer system. (Sandoski-FIRL)
W76-00793

SEWER OVERFLOW - EVALUATION OF MODEL TEST AND USE IN SEWER TECHNIQUE (REGENUEBERLAEUFE - EINE AUSWERTUNG VON MODELLVERSUCHEN MIT ANWENDUNG AUF DIE KANALISATION-STECHNIK),
K-C. Taubmann.
Gas Wasser Abwasser, Vol 52, No 10, p 297-308, 1972. 17 fig, 2 tab, 5 ref.

Descriptors: *Model studies, Sewerage, *Sewers, *Overflow, Weirs, Overfalls, Separated sewers.
Identifiers: *Switzerland, Hydraulic range.

Model tests of different types of sewer overflow to define their hydraulic range of application are discussed. These tests were carried out at the Laboratory of Hydraulic and Earthwork Engineering, Technical University of Zurich. Results for separate sewage systems indicate that the usual weir can only be recommended for the range of small base fall of mixed water inflow. A weir with an overfall and a following throttle section can be used in the transition region between a current and flowing water. For the range of big base fall, a leaping weir is recommended. The leaping weir was tested systematically. Using detailed model tests, the common calculation method can be enlarged and improved, especially for soil opening geometry and separate sewers. (Sandoski-FIRL)
W76-00794

THE OPERATION SYSTEM OF URBAN SEWERAGE TREATMENT (TOSHI GESUISHORIJO NO OPERESHON SHISUTEMU NI TSUITE),
Fuji Electric Co. Ltd., Tokyo (Japan).
Y. Ito.
Kankyo Sozo, (Environmental Creation) Vol 2, No 10, p 45-52, October, 1972. 7 fig.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Descriptors: *Control systems, Operation and maintenance, *Sewage treatment, *Treatment facilities, *Waste water treatment.
Identifiers: *Japan.

The systems operation of an urban sewage treatment plant in Japan involves taking various measurements at each treatment plant and directly sending them to a control room, with data at distant pumps and rivers being sent by telemeters. The control room consists of a monitoring room, a calculator room, and an electric panel console room. The collected data are handled by a computer and the results transmitted directly as control orders to operators, relay panels, sequences for operating pumps, receivers, gates, and valves. Transmitter pumps are operated by telecommunication remote control. Industrial television monitors the conditions of each treatment plant, and the data are recorded generating alarm signals on the operation guide which automatically initiates necessary action. As supplementary apparatus, television and slide displays, an audio stem, typewriters, and trend recorders are used. (Sandoski-FIRL)
W76-00795

ELECTRONIC COMPUTATION OF QUANTITIES AND COSTS FOR SEWERAGE SYSTEMS CONSTRUCTION (MASSENERMITTLUNG UND KOSTENBERECHNUNG IM KANALISATIONSBAU MIT ELEKTRONISCHEN DATENVERARBEITUNGSANLAGEN),
G. Euler, R. Golueke, K. Lerch, and K. J. Ueker.
Wasser und Boden, Vol 24, No 10, p 307-311, 1972. 7 tab.

Descriptors: *Sewerage, *Construction, *Estimated costs, Cost analysis, Construction materials, Automation, Computer programs, Operating costs, Waste water treatment.

A procedure for the electronic computation of quantities and costs for construction of sewerage systems used for cost estimates, dispositions, and the determination of standing values of existing sewerage systems, has been developed. Materials and job costs, type of soil and trench, groundwater level, pipe diameter, bedding conditions, and type of sheet piling are among the input data. Per-meter prices of materials and individual jobs are computed from the output data contained on three data lists and these unit prices are then integrated for a given sewer section. (Sandoski-FIRL)
W76-00796

SEWERAGE DRAINS MADE OF PLASTIC PIPES (KANALISATION MIT KUNSTSTOFFROHREN),.
Wasser, Luft und Betrieb, Vol 16, No 10, p 363-364, 1972.

Descriptors: *Pipelines, Pipes, *Plastic pipes, Construction materials, *Sewers, Waste water treatment.
Identifiers: *Polyvinyl chloride.

Nordrohr type sewer and drain pipes, made of high-density PVC 100 according to DIN 8061 Standards and used in constructing sewer systems, are resistent to most common chemicals; yet pipes with a nominal diameter of 100-200 mm should not be permanently exposed to wastewater with temperature exceeding 60C, and those with a diameter of 250-500 mm to temperatures higher than 40C. Unlike pipes with a diameter of 100-200 mm, those with diameters larger than 250 mm should be laid in a straight line and free of tension. It is possible to combine PVC with pipes made of other materials such as cast iron or stoneware. (Sandoski-FIRL.)
W76-00797

MICROWAVE SEWAGE SYSTEM WITH DISTILLATION MEANS,
Koehler-Dayton, Inc., Dayton, Ohio. (Assignee).
A. H. Cornish, R. C. Helke, A. N. LeDonne, and H. Masters.
United States Patent 3,700,565. Applied April 3, 1970. Issued October 24, 1972. Official Gazette of the United States Patent Office, Vol 903, No 4, p 1368, October 24, 1972.

Descriptors: **Sewerage, *Microwaves, Evaporation, *Patents, Sewage treatment, *Waste water treatment.
Identifiers: Vaporization, Sewage receiving tanks, Evaporation tank.

A self-contained sewage system has been patented in which a microwave energy source is provided to vaporize the liquid phase of the sewage so that it may be removed from the system and the interval between servicings of the system lengthened. The sewage is transferred from the sewage receiving tank to an evaporating tank for evaporation and, in certain embodiments used in situations where power is not at a premium, a portion of the liquid vaporized from the sewage may be returned to the system for flushing purposes. (Sandoski-FIRL)
W76-00800

THE TREATMENT OF RAIN WATER. RAIN OVERFLOW, RAIN OVERFLOW BASINS, RAIN PURIFICATION TANKS, RAIN CATCHMENT BASINS (DIE BEHANDLUNG DE REGENWASSERS),
K. Krauth.
Technische Mitteilungen, Vol 65, No 9, p 445-540, September, 1972. 10 fig, 19 ref.

Descriptors: *Rainfall-runoff relationships, *Sewerage, Overflow, Sewers, Overland flow, Flow duration, Design, Combined sewers, Separated sewers, Treatment facilities, *Waste water treatment.
Identifiers: Germany.

General characteristics of rainfall runoff and design criteria of rain overflows, rain overflow basins, purification tanks, and rain catchment basins are described. The maximum contaminant concentration of effluents from a combined sewer system is reached when rinsing of the sewer at a flow rate of 0.5-0.6 m/sec commences. Runoff carries 67% of the BOD5-load and 83% of the unsolved matter during the first half of the rainfall duration. Separate sewer systems carry smaller contaminant loads during rainfall, except for the initial period of runoff. Formulae for the calculation of the sewage runoff with and without rainfall, and for the critical runoff for combined sewer systems are mentioned with regard to criteria for design purposes. Design criteria of various overflows for critical combined water runoff include the following: (1) an overflow canal with one- or two-sided weirs (flow cross-section height of 20 cm) that leads into a 3- to 5-cm deeper sewer channel; (2) an overflow channel having a spring opening in the bottom (Approximately 50 cm in length to prevent clogging) through which the excess runoff passes; (3) an overflow channel with horizontal separating plates used for large-capacity sewer systems; and (4) a controlled overflow channel in which a flow height measuring instrument and an electric valve regulate the inflow to the purification plant and stabilize the maximum load of the facility. (Sandoski-FIRL)
W76-00801

NON-LINEAR HYDROLOGICAL MODELS FOR CITY WATER DRAINAGE (NIGHT-LINEARE HYDROLOGISCHE MODELLE IN DER STADTENWAESSERUNG),
For primary bibliographic entry see Field 4A.
W76-00802

THE TOTAL RUNOFF COEFFICIENT IN MIXED SEWER SYSTEMS (DER GESAMTABFLUSSBEIWERT IN MISCHKANALISATIONEN),
For primary bibliographic entry see Field 4A.
W76-00803

SPECIAL TIME SCHEDULE FOR THE CI AND COUNTY OF SAN FRANCISCO REL TIVE TO REGULATION OF DISCHARG FROM COMBINED SEWERS,
California Regional Water Quality Control Boa Oakland. San Francisco Bay Region
For primary bibliographic entry see Field 6E.
W76-00806

ELECTROLYTIC WATER TESTER-FO DETERMINATION OF OXYDANT OR REDU ING AGENT CONTENT.
Belgian Patent 800,283. Issued November 1973. Derwent Belgian Patents, January 31, 1974

Descriptors: Equipment, *Paten *Instrumentation, Treatment methods, *Wa treatment, *Waste water treatment, Cont systems, Electrolysis.
Identifiers: *Electrolytic water tester.

An electrolytic water tester for the determinati of oxydant or reducing agent content is describ It consists of an outer shell with an insulating p at one end to support a reference. An indicat electrode is at the other end and has the conne ing leads from those electrodes passing out of The electrode probe is placed within a flow of water to be analyzed at the axis of flow. The dicator electrode is of precious metal (platinum gold) and the reference electrode a metal w (silver or copper); the two electrodes are conc tric and have a longer life than probes us calomel as electrode material. The tester is es cially used for control information and signals determine or regulate rate of addition of neutral ing agent in water treatment plants. (Merritt-FIR W76-00841

ACTIVATED SLUDGE SEWAGE TREATER.
German Patent 2,043,148. Issued November 1973. German Patents Abstracts, Vol U, No 48 2, January, 1974.

Descriptors: *Patents, Treatment metho Sewage, *Sewage treatment, *Activated slud Aeration, Equipment, Hydraulic equipme *Waste water treatment.

An activated sludge sewage treater is describ which has at least one baffle extending transver ly of the longitudinal flow in the annular clos aeration tank. The baffle top edge is below water level, and the baffle is inclined downwa toward the flow to deflect part of it. Preferably tank has two straight sections joined by curv ones. The aerator is in a curved section at the e of the partition separating the straight sectio The baffle is at the beginning of the straight s tion downstream of the aerator. (Merritt-FIRL) W76-00842

METHOD OF FILTRATION.
Australian Patent 441,682. Issued November 1973. The Australian Official Journal of Paten Trade Marks and Designs, Vol 43, No 42, p 44 November 8, 1973.

Descriptors: *Patents, *Treatment metho *Filtration, *Water treatment, Municipal wat *Waste water treatment, Hydraulic equipment.

An improved hyperfiltration process is describ for purifying water by removing solute impurit from an aqueous solution. An inert non-solute jecting filter aid material is deposited to a b depth of from 0.1 to 100 microns on a porous st strate which contains pores large enough to all water to pass through. The material has a parti size in the range of 0.01 to 100 microns. The so tion is passed over the surface of the bed in cr flow to form a solute- rejecting membrane of

l on the bed. A sufficient velocity and pres-
pp is maintained across the bed to force the
through and to allow the filtered material
ct. (Merritt-FIRL)
843

OD AND APPARATUS FOR CONVEYING
GE,
irns, and H. C. Albertsen.
n Patent 940,011. Issued January 15, 1974.
'Brevets, Vol 102, No 3, p 191, January 15,

tors: *Patent, Treatment methods, Con-
Sewers, Engineering structures, *Pressure
s, Hydraulic conduits, *Sewage disposal,
disposal, Waste water treatment.

od and apparatus for conveying sewage
ewage sources such as residences to a
location are described. The sewage is ini-
nveyed by gravity flow from the source
llecting tank and by vacuum-induced plug
a vacuum receiver tank at the remote loca-
ie sewage may be discharged from the
location, preferably under positive pres-
to another line such as a vacuum line for
vacuum-induced plug flow or a gravity
nduit. The final location to which the
is conveyed may be the sewage treatment
Substances for treating the sewage may be
geously introduced into the system and
vith the sewage during conveyance. Self-
tanks, rotation-imparting plug reformers,
eral alternative ways of introducing con-
amounts of air at or above atmospheric
into the vacuum portion of the system are
d. (Merritt-FIRL)
344

CE SCUM EXTRACTOR-FOR RECTAN-
FLOTATION TANK IN SEWAGE
.
Patent 801,156. Issued October 15, 1973.
Belgian Patents Reports, January 31,

ors: *Sewage treatment, *Flotation,
nt methods, *Patents, *Scum, Equipment,
water treatment, Water treatment,
ic equipment, Separation techniques.
rs: *Tanks.

e scum extractor for a rectangular flota-
in sewage works is described. A bridge
running on parallel rails along the sides
nk carries a rotating drum in the form of
checks between which are a number of
al dredger bucket cross-section scraper
These move in the opposite direction to
he bridge as it traverses the length of the
d discharge by gravity into a coaxial worm
gh extractor, or conveyor belt or sloping
t the rear of the bridge is a hinged pusher
ich forces the floating matter forwards on
lades as the bridge moves forwards. By
similar pusher on the front of the bridge
rating them differentially, along with the
ouble profile bucket blades, the system
nade bidirectional. (Merritt-FIRL)
45

D AND APPARATUS FOR INCINERAT-
LLUTED LIQUIDS AND MUD,
ary bibliographic entry see Field 5E.
46

E PIG OR SWIPE,
ary bibliographic entry see Field 8G.
48

NT WATER TREATMENT,
ch.

French Patent 2184-917. Issued February 1, 1974.
French Patents Abstracts, Vol. 5, No. 11, February, 1974.

Descriptors: *Patents, *Effluents, Salts, Water quality, *Waste water treatment, *Sludge treatment.
Identifiers: Chlorisocyanuric acid, Na aluminate, NaOH, Na tripolyphosphate, Oil emulsions, Humic acid colloids, Chemical processes.

Effluent water is treated with an agent consisting of (a) chlorisocyanuric acid or salts of this, (b) Na aluminate, (c) NaOH (d) Na tripolyphosphate or Na hexametaphosphate and Mg sulphate or Mg chloride or Mg oxide. The agents, when added to contaminated water containing fats, or oil emulsions, of humic acid colloids, give excellent proportion of the impurities and purification of the water. The process is especially effective with oil emulsions if the treated water is also subjected to an electric field between two electrodes to give a rapid proportion of the oil as a sludge. (Prague-FIRL)
W76-00849

ACTIVATED SLUDGE PURIFICATION STATION FOR WASTE WATER AND SEWAGE TREATMENT,
French Patent 2187-705. Issued February 22, 1974.
French Patents Abstracts, Vol. 5, No. 11, p 6, February, 1974.

Descriptors: *Patents, *Activated sludge, *Waste water treatment, *Sewage treatment, Stations, Water purification, Injection, Equipment, Tanks.

The station consists of a tank in the form of a body or revolution, with a horizontal axis and is divided internally by partitions which form the boundaries of a primary settlement chamber. The partitions also form, with the end walls, two volumes, one of which acts as a secondary settlement chamber. An injection chimney for the activated sludge has its lower, bell-mouthed end provided with an air nozzle to keep the liquid rising in the chimney. The upper part of the secondary settlement chamber includes an undisturbed filtration area, with an outlet for the purified water. The incoming sewage is seeded immediately in the injection chimney and is mixed with the stream of activated sludge; any abnormal flows can be dealt with satisfactorily. (Prague-FIRL)
W76-00851

WASTE WATER TREATMENT CHEMICAL REACTOR,
French Patent 2187-398. Issued February 22, 1974.
French Patent Abstracts, Vol. 5, No. 11, p 5, February, 1974.

Descriptors: *Patents, *Waste water treatment, Chemical reactions, Pressure, Power, Lime, Equipment, Hydrogen ion concentration, Hydrogen sulfide.
Identifiers: *Chemical reactors.

The reactor, separated by a perforated partition from an overhead 'plug flow' reaction chamber, has a bottom inlet below a convergent/divergent blending nozzle. The throat is fed a reagent, such as a coagulant or a flocculant. The reactor has a low pressure drop (.2-.5 bar), low power requirement, reduced dead space, and is not subject to by-passing reaction. It may be controlled in response to sensors (pH detectors) in upper and lower chambers. The reactor is especially useful for treatment of waste water, such as with lime or H_2SO_4 to control pH. (Prague-FIRL)
W76-00852

CONTINUOUS SEEDING AND ACTIVATING DEVICE.
French Patent 2190-742. Issued March 8, 1974.
French Patents Abstracts, Vol. 5, No. 13, p 6, March, 1974.

Descriptors: *Patents, *Septic tanks, Activation, Effluents, Equipment, *Waste water treatment.
Identifiers: Culture media, Activating devices, Biological purification.

A seeding and activating device for septic tanks consists of a cylindrical recipient with a movable, inclined cover with holes acting as a strainer. The device is placed below the pipe which feeds the effluents into the tank; it is fixed to this pipe or to the wall of the tank and dips into the liquid layer. The recipient is fitted with an overflow pipe. The culture medium in the device can be fed with fresh organisms and natural nutritive substances which are added as required. At the same time a certain amount of mixing and agitation is effected in the culture medium itself. (Prague-FIRL)
W76-00853

FLOATING MIXER FOR WASTE WATER TREATMENT TANK,
French Patent 2187-399. Issued February 22, 1974.
French Patent Abstracts, Vol. 5, No. 11, p 5, February, 1974.

Descriptors: *Patents, *Waste water treatment, *Liquids, Mixing, Tanks, Equipment, Tubes.
Identifiers: Floating mixer, *Mixers.

A float filled with foamed polyurethane, carries an electric motor, and is tethered by cables on the surface of a tank for waste water treatment. The motor drives a helical impeller, shrouded by vertical cylindro-conic tube; flow may be upward or downward. It is deflected radially by a baffle, formed by the bottom of the float, or by a cone in line with bottom of shroud. The motor is protected from liquid by an intercepting plate at bottom of float through which the shaft passes; leakage between shaft and interceptor is returned to the tank by horizontal radial channels through a float. The liquid level maintained above interceptors prevents air entrainment and consequent cavitation at the impeller when flow is downwards. The mixer automatically adjusts to level of the tank liquid and is easily relocated or removed from cleaning. (Prague-FIRL)
W76-00854

SEWAGE DISPOSAL,
E. J. McCrink.
French Patent 2190-738. Issued March 8, 1974.
French Patents Abstracts Vol. 5, No. 13, p 6, March, 1974.

Descriptors: *Patents, *Sewage disposal, *Solid wastes, *Liquid wastes, Distillation, Sewage, *Waste disposal, Tanks, Waste water treatment, *Sewage treatment.
Identifiers: Settling tanks.

Liquid and solid waste materials of sewage are allowed to separate in a settling tank. The solids are removed and are heated in a non-oxidizing atmosphere to the point of destructive distillation. The gaseous products are treated by passing them through a flame curtain to remove any noxious odors. The final product is a finely powdered ash which may be removed and easily disposed. (Prague-FIRL)
W76-00855

ANAEROBIC EFFLUENT TREATMENT,
B. V. Stamicarbon.
Belgian Patent 803-949. Issued February 25, 1974.
Derwent Belgian Patents Reports, Vol. 5, No. 11, p 1, April 18, 1974.

Descriptors: *Patents, *Sludge, Tanks, Flow, Microbiology, Effluent treatment, Anaerobic conditions, Water purification, *Denitrification, Sludge disposal, Waste treatment.
Identifiers: *Microbiological purification, Anaerobic purification.

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Anaerobic microbiological purification of effluent is supplied tangentially to a rotationally symmetrical purification tank containing a microbiological sludge, by introducing the effluent below the surface of the water through greater or greater than 1 device. The outermost of these lies at a distance from the edge of the tank corresponding to 0.5-1.0 times the height of the water, at a velocity such that the tangential flow velocity at any point in the tank is 0.5-2 m/sec and more especially 0.2-1 m/sec. The water containing the micro-biological sludge is discharged after residence in the tank through an opening in or near the center of the tank. (Prague-FIRL)
W76-00856

METHOD AND APPARATUS FOR TREATING SEWAGE,
H. Brociner.
Canadian Patent 944,089. Issued March 19, 1974. Patents/Brevets, Vol. 102, No. 12, p 1057, March, 1974.

Descriptors: *Patents, *Solids, *Sewage, *Sewage treatment, Streams, Effluents, Equipment, Canada, Flow, Liquids, Weirs, Solid wastes, Separation techniques, Waste water treatment.
Identifiers: Effluent sewage, Heavy solids.

Elimination of heavy solids, such as grit, from sewage streams prior to introduction into treatment tanks is necessary as such solids interfere with normal operations. Substantially all of the heavy solids are removed by a process and apparatus where raw sewage is introduced into a tank with the bottom sloping downwardly from the far side to a trough adjacent a first sidewall, with even distribution along the first sidewall. A predetermined small range of liquid level variation is maintained by flowing effluent sewage over a weir extending above the full length of the top of the sidewall opposite the first sidewall. Air is introduced with even distribution through and along the first sidewall to induce circulatory flow of liquid and light-weight solids upwardly and then in the direction of the opposite sidewall. This turns the circulatory flow direction downwardly toward the tank floor by a baffle spaced from the opposite sidewall and positioned transferse to the direction of liquid flow through the tank, to effect separation of light-weight solids and flowing the sewage suspension under the baffle and upwardly for removal by flow over the weir. (Prague-FIRL)
W76-00857

SEWAGE PURIFIER WITH DROP BODY AND SUMP TROUGH FOR ACTIVATED SLUDGE.
German Patent 2028047. Issued March 21, 1974. German Patents Abstracts, Vol 5 No 7, p 2, March, 1974.

Descriptors: *Patents, *Sewage, *Water purification, *Activated sludge, Sumps, *Sewage treatment, *Waste water treatment.
Identifiers: *Sewage purification, Central mixing zone, Settling zone, Sump trough, Drop body.

A central mixing zone is bounded by walls reaching on all sides above the liquid surface in the trough. It extends out from into the trough, from the settling zone between these walls and the inner side of the trough's bounding wall. The raw sewage inlet ducts, the drop body drain, and the branch duct for the returned settled sludge and liquid open into the mixing zone. The settling zone is divided into separate zones to interrupt the horizontal movement of liquid. (Prague-FIRL)
W76-00858

BIOLOGICAL PURIFICATION OF SEWAGE,
French Patent 2190-739. Issued March 8, 1974. French Patents Abstracts, Vol 5, No 13, p 6, March, 1974.

Descriptors. *Patents, *Sewage, Biological treatment, Reservoirs, Sewage water, Anaerobic conditions, Nitrates, Clarification, *Sewage treatment, Waste water treatment
Identifiers: *Biological purification, Feed reservoirs, Aerobic treatment.

Purification is carried out using three reservoirs of which greater or equal to 2 serve as feed reservoirs for the sewage water, and one as a clarification reservoir. The sewage water in the first feed reservoir is circulated aerobically for part of the time and anaerobically for the rest of the time. It is then discharged to the clarifying reservoir through the third reservoir where it has aerobic treatment. The feed reservoir may be connected to the clarifying reservoir directly during its aerobic period, and to the third reservoir during its anaerobic period. The functions of the two feed reservoirs are changed over periodically. Precipitation takes place in the presence of inorganic compounds, in particular of nitrates, which may be produced. (Prague-FIRL)
W76-00859

BIOLOGICAL SEWAGE TREATMENT PLANT WITH CENTRIFUGAL AERATOR AT WATER SURFACE,
German Patnet 1759861. Issued March 21, 1974. German Patents Abstracts, Vol 5, No 7, p 1, March, 1974.

Descriptors: *Sewage treatment, *Patents, *Biological treatment, *Treatment plants, Channels, Tanks, *Waste water treatment, Oxidation.
Identifiers: Oxidation tank, Biological sewage treatment plant, Sewage flow, Aerators.

A partition between two straight troughts forming the oxidation tank reaches solely up to the aerator/circulator, which rotates about a vertical axis at one of the curved sections connecting the troughs. The partition is curved near the aerator twoard the channel side in which the sewage flows down toward the aerator. (Prague-FIRL)
W76-00860

NERC 74, ANNUAL REPORT.
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-00879

ASSESSING A MARSH ENVIRONMENT FOR WASTEWATER RENOVATION,
Agricultural Research Center, Fort Lauderdale, Fla.
K. K. Steward, and W. H. Ornes.
Journal Water Pollution Control Federation, Vol. 47, No. 7, p 1880-1891, July 1975. 7 fig, 6 tab, 28 ref.

Descriptors: *Reclaimed water, *Water reuse, *Marshes, *Florida, Marsh plants, Soils, Nutrients, Waste water(Pollution), Plant physiology, Nutrient requirements, Physiological ecology, Plant growth, Nitrogen, Phosphorus, Potassium.
Identifiers: *Everglades National Park.

Experiments were conducted in situ on isolated plots in a marsh to assess the capability of the system for renovating wastewater. Artificial enrichment of sawgrass did not produce increased growth even though nutrients were assimilated. Thus, growth was not nutrient limited. Weekly applications of 2.2 kg/ha of phosphorus increased tissue levels fivefold after 22 wk. However, this increase represented only 12% of the amount applied. The marsh system seems to have a limited capacity for assimilating nutrients. This capacity was stressed after 3 wk and overloaded by 8 wk at a continuous rate of enrichment. Because of this capacity for nutrient absorption, it was unlikely that sawgrass plants could be used to renovate wastewater efficiently with high nutrient concentrations. (Sims-ISWS)
W76-00892

MONITORING ON-FARM WASTE MA
MENT SYSTEMS.
Iowa State Univ., Iowa City. Agricultura
sion Station
S. W. Melvin, D. H. Vanderholm, and J. C
Lorimor.
Presented at 1973 Winter Meeting, A
Society of Agricultural Engineers, Chi
linois, December 11-14, 1973, Paper No. 7
p.

Descriptors: *Monitoring, *Farm
*Management, Hogs, Cattle, Feed lots,
Odor, Costs, Livestock, Corn Belt, Iowa
Identifiers: Beef.

Research and demonstration sites
established to study waste management
tives applicable in the Corn Belt. These si
all commercial livestock operations incl
wide variety of beef and swine handling
Among the data collected were runoff qu
quantity, waste characteristics, climatic d
data, and operating characteristics and p
Results of the study showed that regular
and maintenance of a low stocking rate
feedlots results in pollutional strength of
feedlot runoff of nearly 1/10 the po
strength of lots seldom cleaned, heavily
and heavily packed with manure. Mos
basins or settling channels required a s
bottom of concrete or gravel to allow
cleanout and maintenance. These site
proved to be valuable resources in the
waste management educational program
on by Iowa State University extensio
(Cameron-East Central)
W76-00914

HYDRAULIC HANDLING OF PO
MANURE INTEGRATED INTO AN
RECOVERY SYSTEM.
California Univ., Berkeley.
G. C. Golueke, and W. J. Oswald.
In: Proceedings of the 1969 National Poultr
and Waste Management Seminar, Sa
Maryland, September 29-30, 1969, p. 57-7
14 ref.

Descriptors: *Poultry, *Farm
*Hydraulics, *Waste treatment,
Recycling, Settling tanks, Digestion tank,
Effluent, Aerobic conditions, Anaerobic
tions, Centrifugation.
Identifiers: *Manure, *Algae pond, Loadin

Because of increasing pollution regulations
banization of rural areas, the problems of d
of animal wastes are becoming more co
Disposal by land spreading has in the past b
major means of disposal, but in many are
method is no longer feasible. New and ec
cally feasible methods of disposal are
developed and adopted. One such met
photosynthetic reclamation, with the inc
tion of a manure hydraulic flushing and tr
system. At the University of California's S
Engineering Research Laboratory a thr
project is being conducted. Its objectives
reduce the nuisance qualities of wastes and
process, researchers are trying to recove
which would be fed back to the animals. T
ject also involves the laboratory studies and
and construction of an algae growth pond
for the future call for experiments in wh
anaerobic phase will be by-passed. Also th
which is harvested as a product of the wast
be fed to ruminants to determine its n
potential. (Russell-East Central)
W76-00915

SOCIAL, LEGAL, AND ECONOMIC
SIDERATIONS OF ANIMAL PRODUCTI
URBANIZED AREAS,
A. Aust.

Second National Symposium on Poultry Indus-
Waste Management, University of Nebraska,
coln, May 19-20, 1964, p. 225-240.

scriptors: *Poultry, *Management, *Legal
ects, *Social aspects, *Economics,
banization, Water pollution sources.

hin the last forty years, our country has un-
gone extensive urbanization. The poultry
ner or industrialist must face the ever growing
anization of our society to effectively function
he world of today and tomorrow. There are
e social developments which have been accen-
ed by urbanization that restricts the location of
nal processing plants. These are: (1) the growth
large concentrations of people crowded
ether; (2) the tremendous technological ad-
ces of our society; and (3) the growing af-
nce, education, and cultural sophistication of
society. Because of these social changes many
l developments have taken place in the past
years. New legal restrictions or controls on
animal industry usually fall into four main
gories: (1) planning controls; (2) public health
trols; (3) public safety codes; and (4) aesthetic
trols. Closely related to social and legal
elopments are the economic considerations af-
ing the locating of new processing plants and
operation of existing plants. There are three
rses of action open to the poultry industrialist
erms of economics. These are: (1) the laissez-
e or do-nothing approach; (2) the self-sufficient
roach; and (3) the good citizen approach. The
d citizen approach is economically the best ap-
ach to the poultry man. (Russell-East Central)
5-00916

ALTH ASPECTS OF POULTRY WASTE
POSAL,
ert A. Taft Sanitary Engineering Center, Cin-
ati, Ohio.
primary bibliographic entry see Field 5E.
5-00917

GOONS--SINK OR SWIM,
nder's Leghorns, Ferndale, N.Y.
Brender.
Second National Symposium on Poultry Indus-
Waste Management, University of Nebraska,
coln, May 19-20, 1964, p. 183-192.

criptors: *Lagoons, *Farm wastes, *Poultry,
ste storage, *Waste treatment, Odor.

oor' and 'outdoor' 'lagooning' are two
ods often employed by poultry farmers for
e storage and treatment. With either type, the
tryman fights an odor problem. To prevent
and to beneficially handle manure, the
try man should catch manure in waterproof
s; keep it covered with water at all times;
e it out before it settles down; either haul it
spread it on crops or stabilize it in an outdoor
on; and move wastes by gravity. The author
icts that present and future research will solve
y of the current lagoon odor, decomposition,
pollution problems. (Russell-East Central)
-00918

TEMS AND SITUATIONS FOR HANDLING
LTRY WASTES,
ell Univ., Ithaca, N.Y. Dept. of Poultry and
nce.
Ostrander.
ented at the Southeastern Poultry and Egg As-
tion 1971 Poultry Health Seminar, Oct. 18-19,
, 7 p.

riptors: *Poultry, *Farm wastes, *Waste
ge, *Waste treatment, *Waste disposal,
ycling, Oxidation lagoons, Lagoons,
dration, Hydraulic equipment, Fertilizers.
ifiers: *Waste management, *Land spread-
Refeeding.

Some poultrymen have deep pits to hold the waste until it can be spread on land. These pits must be kept reasonably dry and must be cleaned at least once a year. Another system is the hydraulic system in which the droppings are pushed out by water pressure into a storage facility. Waste then must be placed in an aerobic lagoon to prevent odors. Some men use oxidation ditches. Some attempt storage for long periods of time. As a general rule, waste must eventually be spread on land. Recently, dehydration and recycling as feed has gained attention. Price has been the discouraging factor in dehydration, and only about 10% of the waste can be recycled as feed, leaving the rest to be disposed of by some other method. (Russell-East Central)
W76-00920

STATE OF WISCONSIN V. MICHELS PIPELINE CONSTRUCTION, INC. (ACTION FOR AN ORDER TO CONSTRUCT SEWER SO AS NOT TO CREATE A NUISANCE TO NEIGHBORING LANDOWNERS).
217 N.W.2d 339 (Wis 1974).

Descriptors: *Groundwater availability, *Sewage disposal, *Wisconsin, *Sewage, Judicial decisions, Wastes, Sanitary engineering, Water quality control, Waste disposal, Groundwater resources, Ground water, Water supply, Water table, Subsurface waters, Water pollution.
Identifiers: *Public use, *Nuisance(Water law).

An action was brought seeking an order directing the defendents to conduct construction of a sewer so as not to create a public nuisance. The plaintiff alleged that the defenants undertook construction of the sewer with knowledge that dewatering of the soil would lower the groundwater table from which area residents drew water. The court held that a possessor of land who withdraws groundwater from the land and uses it for a beneficial purpose is not subject to liability for interference with the use of water by another, unless the withdrawal causes unreasonable harm through lowering the watertable. (Proctor-Florida)
W76-00952

CITY OF WAUKENGAN V. POLLUTION CONTROL BOARD (APPEAL FROM PROCEEDING ASSESSING FINES AGAINST CITIES AND CORPORATION).
For primary bibliographic entry see Field 5B.
W76-00954

DISAPPROVAL OF THE DEFERRAL OF WATER POLLUTION CONSTRUCTION GRANT FUNDS.
For primary bibliographic entry see Field 6C.
W76-00986

SOUTHWESTERN STOCKHOLM REGIONAL TREATMENT SYSTEM,
Southwestern Stockholm Regional Water and Sewerage Works, Inc. (Sweden).
A. Cronstrom.
J Water Pollut Control Fed, Vol 45, No 8, p 1783-1788, 1973, Illus.

Descriptors: *Waste water treatment, Sweden.
Identifiers: Lake Malareu(Sweden), Himmerfjarden Bay(Sweden).

In 1963, the Court of Water Law passed a ruling that established guidelines for sewerage planning in the greater Stockholm area of Sweden. The ruling required that all wastewater treatment shall maintain a biochemical O2 demand removal of 95% during normal operating periods; existing combined sewers shall be reconstructed as separate systems; Lake Malaren, the freshwater source for the area, shall ultimately be relieved of all sewerage outlets; and the discharge of nutrients shall be limited by providing the best technique of treatment. To meet the demands of the ruling, an interregional system was proposed. All wastewater will be collected in a central system and treated at an activated sludge plant before discharge to Himmerfjarden Bay on the Baltic Sea.--Copyright 1974, Biological Abstracts, Inc.
W76-00996

5E. Ultimate Disposal Of Wastes

ENVIRONMENTAL SURVEY OF TWO INTERIM DUMPSITES-MIDDLE ATLANTIC BIGHT. SUPPLEMENTAL REPORT.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-239 257, $5.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA 903/9-74-010B, October, 1974. 105 p, 30 fig, 6 tab, 28 ref. D. H. Lear, editor.

Descriptors: *Water pollution effects, *Waste disposal, *Oceans, Environmental effects, Surveys, Benthic fauna, Iron, Heavy metals, Cadmium, Mollusks, Zooplankton, Ultimate disposal, Atlantic Ocean.
Identifiers: *Ocean dumping, Vanadium, Atlantic Bight.

Supplemental data from an environmental survey of two interim dumpsites in the Mid-Atlantic Bight are reported. Dissolved and particulate organic carbon accumulations were not found in the water column studied. Dissolved and particulate organic carbon accumulations are probably dependent on time of latest release and are also a cumulative function of time. No patterns of distribution in the water column were observed for particulate and dissolved iron, in spite of the weak themocline. Statistical treatment of the data shows that metals disposed of in the oceans accumulate in the tissue of benthic organisms in quantities roughly proportional to the amounts dumped, that certain metals, such as vanadium and cadmium, are dumped in such quantities in one of the two studies such that they may be used as tracers for that dumpsite, and that the effects of these dumped materials are spread over a large undetermined area. Zooplankton populations at the sample locations showed no effects of stress. (Orr-FIRL)
W76-00511

IDENTIFICATION OF OBJECTIONABLE ENVIRONMENTAL CONDITIONS AND ISSUES ASSOCIATED WITH CONFINED DISPOSAL AREAS,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W76-00516

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART V, OTHER TYPES OF WELLS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00525

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS. PART IX, LANDFILLS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-00526

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusets Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W76-00545

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INCENERATOR FOR RAW SEWAGE,
Morse Boulger, Inc., Flushing, N.Y. (Assignee).
C. M. Mainka, and G. A. Nash.
United States Patent 3,896,745. Issued July 29, 1975. Official Gazette of the United States Patent Office, Vol 936, No 5, p 1647, July, 1975. 1 fig.

Descriptors: *Patents, *Sewage disposal, *Incineration, Waste disposal, *Waste treatment.
Identifiers: *Incinerators.

A patent was granted for an incinerator for the thermal disposal of raw sewage. The housing consists of: a primary combustion chamber, a secondary combustion chamber, and a mixing chamber connecting the primary and secondary combustion chambers. A burner is mounted on the housing, and includes means for injecting a flame through the primary combustion chamber, toward the mixing chamber. There the flame functions to ignite waste material, producing combustion gases. Any liquid constituents of the waste material are vaporized, and an induced draft is produced in the primary combustion chamber. This causes the flow of combustion gases and vapor toward and through the mixing chamber, into the secondary combustion chamber. There the mixture is ignited for secondary combustion. A flue mounted on the housing conducts residual combustion gases from the secondary combustion chamber into the ambient atmosphere. (Kramer-FIRL)
W76-00580

COUNTER-FLOW SLUDGE BURNER,
J. E. Hanway, Jr.
Canadian Patent 973,018. Issued August 19, 1975. Patent Office Record, Vol 103, No 33, p 26, August 19, 1975.

Descriptors: *Sludge treatment, *Sludge disposal, *Incineration, *Combustion, *Patents, Equipment, Ultimate disposal, Oil, Pumping, Temperature, Waste treatment.

An incineration method for sewage sludge has been patented. The dewatered sludge is dispersed downwardly in an upwardly flowing atmosphere within a firebox where the temperature is maintained high enough to dry and burn the sludge while it is falling. The ash and other products of combustion move upwardly to a gas scrubber and ash separator; relatively clean gas is discharged to the atmosphere. The firebox is preheated by a burner at the bottom of the box. Further burning of fuel at this burner or addition to the sludge feed is performed as required to maintain the necessary temperature. Addition of fuel oil to the sludge before pumping the sludge facilitates pumping, and achieves mixing. Supplementary air is fed in somewhat tangentially at the bottom to impart rotation to the gases within the firebox. (Orr-FIRL)
W76-00590

SEPTIC TANKS,
Carlson (Andrew) and Sons, Inc. Kings Park, N. Y. (Assignee).
A. L. Carlson, and J. R. Pinezich.
United States Patent 3,898,162. Issued August 5, 1975. Official Gazette of the United States Patent Office, Vol 937, No 1, p 202-203, August, 1975. 1 fig.

Descriptors: *Patents, *Sewage disposal, *Waste disposal, *Septic tanks, Equipment.

A patent has been issued for a method of sewage disposal. The system consists of a leaching pool having a wall with effluent slots and a frusto-conical dome atop the wall which forms the top and sides of a concave-convex bowl-shaped septic tank. This tank is located below the level of the top of the leaching pool wall and has a peripheral flange held by the leaching pool wall top and the dome. The flange supports the septic tank in the upper part of the pool, and the septic tank extends only part of the way down into the leaching pool and is provided with an inspection opening in its bottom. The inspection opening is held closed and sealed by the weight of sewage in the tank. Included in the systems are a baffled inlet in one side of the dome and a tubular outlet partly within the dome and partly within the septic tank for the discharge of treated sewage into an outlet pool between the tank and the pool wall. (Kramer-FIRL)
W76-00598

GROUND-WATER QUALITY BENEATH SOLID-WASTE DISPOSAL SITES AT ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5B.
W76-00656

EVALUATION OF HEALTH HAZARDS ASSOCIATED WITH SOLID WASTE/SEWAGE SLUDGE MIXTURES,
East Tennessee State Univ. Johnson City, Tenn. Dept. of Health Sciences.
W. L. Gaby.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. Environmental Protection Agency, Report EPA-670/2-75-023, April 1975. 47 p, 15 fig, 7 tab, 26 ref. 1DB064;ROAP 24ALU;Task 03. 68-03-0128.

Descriptors: Solid wastes, *Bacteria, Bioindicator, *Parasites, *Public health, *Sewage sludge, Recycling, Sludge, *Pathogenic bacteria.
Identifiers: Pathogens, *Composting, *Windrow composting process.

The health hazards associated with municipal solid waste/sewage sludge composting by the windrow composting process are described. The occurrence and survival of pathogens, parasites, and indicator bacteria at various stages during the composting process are described. The study shows that windrow temperatures of 120F to 167F (49C-74C) maintained for at least 7 days destroy pathogens and human parasites. Dog parasitic ova, however, remain intact 35 days after exposure. Considerable variation in the temperature is found at the top and bottom 2 inches of the windrow indicating that proper turning of the compost is essential to ensure destruction of pathogens and parasites. It is concluded that a properly composted solid waste or solid waste/sewage sludge mixtures is microbiologically acceptable as a soil conditioner for gardens, farms, and lawns, or for filling areas of erosion without creating health hazards. (EPA)
W76-00681

DISPOSAL AND UTILIZATION OF WASTE KILN DUST FROM CEMENT INDUSTRY,
Southern Reserach Inst., Birmingham, Ala.
For primary bibliographic entry see Field 5D.
W76-00686

CHARACTERIZATION AND UTILIZATION OF MUNICIPAL AND UTILITY SLUDGES AND ASHES, VOLUME I-SUMMARY,
Dayton Univ. Ohio Research Inst.
N. L. Hecht, and D. S. Duvall.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-033a, May 1975. 33 p, 1 tab. 1DB064; ROAP 24ALH; Task 008. EPA Grant No. R-800432.

Descriptors: *Sludge, *Waste disposal, *Sludge disposal, *Incineration, *Waste water treatment, *Treatment facilities, Municipal wastes, Industrial wastes, Ultimate disposal.
Identifiers: *Municipal sludges, *Utility coal ashes, Municipal incinerator residue.

The nature and disposal practices for mun and utility sludges and ashes were studied study was primarily concerned with the sl from municipal waste water, and water trea plants, coal ash from power stations and residue from municipal incinerators. Each of subject areas is presented in a separate re Volume I of this series presents the summa the results and conclusions developed for ea the subject areas. (See W76-00688 thru 00690) (EPA)
W76-00687

CHARACTERIZATION AND UTILIZATIO MUNICIPAL AND UTILITY SLUDGES ASHES. VOLUME II - MUNICIPAL SLUDG
Dayton Univ. Ohio. Research Inst.
N. L. Hecht, D. S. Duvall, and A. S. Rashidi.
Available from the National Technical Infc tion Service, Springfield, Va 22161. Enviro tal Protection Agency, Report EPA-670/2-75- May 1975. 231 p, 65 fig, 85 tab, 202 ref. 1D ROAP 24ALH; Task 008. R800432.

Descriptors: *Waste disposal, *Sl Economics, *Sludge disposal, Drying, *V water treatment, Treatment facilities, Mun wastes, Ultimate disposal.
Identifiers: *Municipal sludges, Sludge han *Municipal wastewater.

A comprehensive characterization and evalu was performed of disposal and utilization tices for sludges from municipal wastewate water treatment plants. The nature and quan of the of the sludges were discussed. Va sludge handling and treatment techniques detailed. Problems encountered in sludge dis were reviewed, and the economics of waste sludge disposal were discussed. (See also 00687) (EPA)
W76-00688

CHARACTERIZATION AND UTILIZATIO MUNICIPAL AND UTILITY SLUDGES ASHES, VOLUME III - UTILITY COAL ASI
Dayton Univ. Ohio. Research Inst.
N. L. Hecht, and D. S. Duvall.
Available from the National Technical Infc tion Service, Springfield, Va 22161. Environ tal Protection Agency, Report EPA-670/ 033C, May 1975. 66 p, 7 fig, 17 tab, 82 ref. 1D ROAP 24ALH; Task 008. R800432.

Descriptors: *Coals, *Waste disposal, Poll abatement, Industrial wastes, Sludge disp Solid wastes, Ultimate disposal.
Identifiers: *Utility coal ash, Generation r Energy requirements, *Coal ash wastes.

The residue from the burning of coal, colle from the stack effluent and the bottom o boiler unit, is another solid waste disposal pr that the community must be concerned with. 1940 more than 300 million tons of this coal as been generated, of which only about 30% has utilized. The nature of coal ash has been def the quantities produced have been determine the locations of the major utilities generatin coal ash have been established. In addition, th ticipated compositional changes and quantiti be generated in the future resulting from expa energy requirements, advancements in techno and pollution controls have been evaluated. study also included a review of current disp and utilization practices. (See also W76-0 (EPA)
W76-00689

CHARACTERIZATION AND UTILIZATION MUNICIPAL AND UTILITY SLUDGES ASHES. VOLUME IV - MUNICIPAL INCINE TOR RESIDUES,
Dayton Univ. Ohio. Research Inst.
N. L. Hecht, and D. S. Duvall.

lable from the National Technical Informa- Service, Springfield, Va 22161. Environmen- rotection Agency, Report EPA-670/2-75-033d, 1975. 58 p, 8 fig, 28 tab, 61 ref. 1DB064; P 24ALH; Task 008. R800432.

riptors: Economics, *Incineration, Solid es, *Waste disposal, Ultimate disposal, nicipal wastes.
tifiers: Disposal practices, *Municipal in- rators.

composition and current disposal practices for residue resulting from the incineration of n refuse have been studied. In addition, the acteristics of urban refuse are described, and ocation and capacity of the nation's municipal erators specified. The economic and technical ntial for utilizing materials recovered from the ue have also been studied. (See also W76-7) (EPA)
00690

ONSTRATED TECHNOLOGY AND EARCH NEEDS FOR REUSE OF MU- PAL WASTEWATER,
Engineers, Long Beach, Calif.
rimary bibliographic entry see Field 5D.
00692

UMN STUDIES OF SOIL CLOGGING IN A WLY PERMEABLE SOIL AS A FUNCTION FFLUENT QUALITY,
onsin Univ., Madison Dept. of Soil Science.
rimary bibliographic entry see Field 5B.
00721

AGE DISPOSAL SYSTEMS,
sh.
ed States Patent 3,701,428. Applied July 17, Issued October 31, 1972. Official Gazette of Jnited States Patent Office, Vol 903, No 5, p October 31, 1972.

riptors: *Sewage disposal, *Plastic pipes, tic tanks, *Patents, Sewerage, Construction rials, *Waste disposal.

wage disposal unit has been developed which prises a plurality of flexible sewer pipes ed to be connected at one end to the mains of wage disposal system, flexible plastic septic submerged in a body of water adjacent to the sewage mains, and connections between the ends of said flexible sewer pipes. The mains onnected for discharge through the plastic into the flexible plastic septic tank which is orted and protected by the surrounding water ich it is submerged. (Sandoski-FIRL)
00773

HOD AND APPARATUS FOR CONVEYING AGE,
rimary bibliographic entry see Field 5D.
00844

HOD AND APPARATUS FOR INCINERAT- POLLUTED LIQUIDS AND MUD,
Pariel, and G. Robic.
dian Patent 940,379. Issued January 22, 1974. ts/Brevets, Vol 102, No 4, p 270, January 22,

riptors: *Patents, *Equipment, Pollutants, neration, *Liquid wastes, *Mud, Oxidation, te water treatment, Waste disposal.

thod and apparatus for incinerating polluted s and mud are described. The pollutants are ed inside a reaction chamber in the presence oxidizer with a mixture formed by the mutual rsion of non-miscible phase containing the ants and a liquid. (Merritt-FIRL)
00846

DRAIN FOR WASTEWATER.
German Patent 2,248,970. Issued February 7, 1974. German Patents Abstracts, Vol 5, No 2, p 3, March, 1974.

Descriptors: *Engineering structures, Buildings, *Drainage engineering, *Plastics, *Patents, Water pollution treatment, *Waste water disposal, Drainage wells, *Drains.
Identifiers: Thermoplastics.

A patent has been issued for a drain for wastewater in the foundation of a building made of thermoplastic material and enclosed in the concrete. Leaking of underground water is prevented by a flexible collar on the drain which is supported by radial metal rods, embedded at one end in the drain and bent around the collar at the other end. (Murphy-FIRL)
W76-00847

SEWAGE DISPOSAL,
For primary bibliographic entry see Field 5D.
W76-00855

ANAEROBIC EFFLUENT TREATMENT,
For primary bibliographic entry see Field 5D.
W76-00856

LAND DISPOSAL OF EFFLUENT FROM A SANITARY LANDFILL,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
R. A. Nordstedt, L. B. Baldwin, and L. M. Rhodes.
Journal Water Pollution Control Federation, Vol. 47, No. 7, p 1961-1970, July 1975. 1 fig, 9 tab, 10 ref.

Descriptors: *Solid wastes, *Landfills, *Leachate, *Florida, Irrigation, Effluents, Liquid wastes, Irrigation effects, Path of pollutants, Reclaimed water, Water quality, Impaired water use, Waste disposal, Waste treatment, Waste water(Pollution), Disposal, Groundwater, Pastures, Soils, Nutrients, Chemicals, On-site investigations.
Identifiers: Land disposal.

About two-thirds of Florida is relatively flat land, generally with poor to very poor natural drainage. Consequently, sanitary landfills for many cities and counties are located in high water table areas. Before land disposal of effluent from a sanitary landfill may be used effectively, the impact on plants, soils, and groundwater should be evaluated. An excellent opportunity exists in Florida to improve unproductive land for other uses by sanitary landfilling. An unproductive low-lying area was reclaimed for pastureland by sanitary landfill on a sandy soil in a high water table area. Effluent from the trench method landfilling operation consisted of groundwater and leachate from previously filled trenches. The effluent was dispersed on nearby established pasture with a sprinkler irrigation system. No adverse effects on the soil or shallow groundwater were measured. Visual evaluation of the pasture grasses indicated an improvement in growth rate and appearance. (Sims-ISWS)
W76-00893

CHLORIDE CONTAMINATION IN ALUM CREEK, CENTRAL OHIO.
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 5B.
W76-00910

PLANNING LAND APPLICATION OF MANURE,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W76-00913

MONITORING ON-FARM WASTE MANAGEMENT SYSTEMS.
Iowa State Univ., Iowa City. Agricultural Extension Station.
For primary bibliographic entry see Field 5D.
W76-00914

HYDRAULIC HANDLING OF POULTRY MANURE INTEGRATED INTO AN ALGAL RECOVERY SYSTEM.
California Univ., Berkeley.
For primary bibliographic entry see Field 5D.
W76-00915

HEALTH ASPECTS OF POULTRY WASTE DISPOSAL,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
C. W. Chambers, and N. A. Clarke.
In: Second National Symposium on Poultry Industry Waste Management, University of Nebraska, Lincoln, May 19-20, 1964, p. 193-212. 18 ref.

Descriptors: *Poultry, *Farm wastes, *Waste disposal, *Public health, Bacteria, Fungi, Viruses, Diseases, Human diseases, Water pollution sources.

Interest in the disposal of poultry waste has stirred interest in the health aspects of poultry waste disposal. Many diseases are possibly communicable to man from poultry wastes. These diseases are caused usually by bacteria, fungi, or viruses. There are many avenues of transmission of the disease, such as direct contact with waste; ingestion of waste; inhalation of waste; and direct or indirect contact with vectors such as insects. Many diseases, such as those caused by the Salmonella species, can be transferred to man. To prevent the spread of disease, the poultry farmer should attempt to control conditions which result in multiplication of disease-producing organisms. The source of the disease-production should be eliminated if possible. The waste should be processed in a way which would breakdown the chain of infection. Above all, the poultry farmer should practice good management and remain rational about the subject of disease and disease potential. (Russell-East Central)
W76-00917

LAGOONS--SINK OR SWIM,
Brender's Leghorns, Ferndale, N.Y.
For primary bibliographic entry see Field 5D.
W76-00918

SYSTEMS AND SITUATIONS FOR HANDLING POULTRY WASTES,
Cornell Univ., Ithaca, N.Y. Dept. of Poultry and Science.
For primary bibliographic entry see Field 5D.
W76-00920

UNION OIL CO. V OPPEN: RECOVERY OF A PURELY ECONOMIC LOSS IN NEGLIGENCE (NOTE ON CASE ARISING FROM OIL SPILL).
For primary bibliographic entry see Field 6E.
W76-00924

NO DUMPING IN THIS OCEAN: NEARING THE END OF SHIP-GENERATED POLLUTION,
For primary bibliographic entry see Field 5B.
W76-00930

LEGAL MEASURES CONCERNING MARINE POLLUTION.
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6E.
W76-00963

LIBRARY U. OF I. URBANA-CHAMPAIGN

INTERNATIONAL OCEAN DUMPING OF INDUSTRIAL CHEMICAL WASTE,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6E.
W76-00968

5F. Water Treatment and Quality Alteration

AN EVALUATION OF WATER REUSE FOR MUNICIPAL SUPPLY,
Southern Illinois Univ., Carbondale.
For primary bibliographic entry see Field 5D.
W76-00514

O AND M GUIDE FOR THE SUPPORT OF RURAL WATER-WASTEWATER SYSTEMS.
Conset, Inc., Washington, D.C. National Demonstration Water Project.
Commission on Rural Water, Chicago, Illinois, 1974, 283 p, 21 fig, 45 tab, 34 ref.

Descriptors: *Waste water treatment, *Sanitary Engineering, *Water treatment, *Management, *Marketing, Aeration, Flocculation, Oxidation, Coagulation, Filtration, Water supply, Treatment plants, Maintenance, Personnel management, Rural areas.
Identifiers: Handbooks.

Management of the support company is discussed from the start-up phase and organizational tasks, through the steady-state phase. Problems such as consumer complaints, and inspections are discussed. The water purification and distribution system operations are explained; technical terms are defined. The processes involved are delineated. Operation of a wastewater system is described. Waste disposal methods, and standards for purification are reviewed. Methods of monitoring the system are given. Skilled plant operators and their training are important. The job requirements and work loads for operators are discussed. Cost estimations of various parts of the system from equipment to power are presented. (Bradbeer-NWWA)
W76-00530

COMMON FUNDAMENTALS IN THE TECHNOLOGIES OF WATER AND WASTEWATER TREATMENT, (A VIZ-ES SZENNYVIZTITAS TECHNOLOGIAIAJAUAK KOZOS ALAPJAI),
For primary bibliographic entry see Field 5D.
W76-00561

DESIGNING WATER TREATMENT PLANTS AT THE CIVIL ENGINEERING CONSULTING FIRM MELYEPTERV (VIZTISZTITAS TERVEZES A MELYEPTIESI TERVEZO VALLALATNAE),
Melyepterv, Budapest (Hungary).
G. Peter.
Hidrologiai Kozlony, Vol 55, No 6, p 233-235, June, 1975.

Descriptors: *Water treatment, *Design criteria, *Treatment facilities, Potable water, Civil engineering, Engineering personnel, Reviews, Surface waters, *Foreign research, Waste water treatment, Europe.
Identifiers: *Hungary.

The accomplishments of the consulting engineering firm Melyepterv in Hungary as the first native firm to design water treatment plants are described. Until the 1950's all water treatment facilities in Hungary had been constructed by foreign corporations. With development in urbanization and industrialization, new problems of water management have occurred. Experiences with removal of suspended solids, and water softening and desalination for industrial plants, and design of facilities for potable water have been successful. Also, iron and manganese removal and the treatment of surface waters to a potable water quality have been achieved. Research and development has been carried out at Melyepterv in the operation of new facilities. Such technical knowledge has been applied to clarification, filtration, iron and manganese removal, and taste and odor control. A review is presented of the standardization and product development at this firm and the water treatment plants developed by Melyepterv over the past two decades for customers in Lebanon, Nigeria, Cuba, and Czechoslovakia. (Kramer-FIRL)
W76-00562

APPARATUS FOR DISSOLVING LARGE QUANTITIES OF OXYGEN IN WATER,
Naigai Kogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W76-00570

METHOD AND APPARATUS FOR MONITORING AND CONTROLLING HALOGEN LEVELS IN A WATER TREATMENT SYSTEM,
D. P. DeVale.
United States Patent 3,897,798. Issued August 5, 1975. Official Gazette of the United States Patent Office, Vol 937, No 1, p 86, August, 1975. 1 fig.

Descriptors: *Patents, *Water treatment, *Monitoring, *Halogens, Equipment, Electrodes, Pollutant identification.

A patented method and apparatus to monitor and control halogen levels in a water treatment system are detailed. Given that a particular halogen substance in liquid has a predetermined redox potential, a probe including a pair of capacitively coupled electrodes disposed in the liquid is used. The electrodes are periodically pulsed with a voltage pulse having a peak value slightly above the predetermined redox potential, to store a charge in the capacitance. The stored charge decays between pulses via the liquid between the electrodes at a rate determined by the content of the halogen. The charge is sensed across the electrodes by means that operate to generate a substance level indication signal. Additionally, display means respond to the substance level indication signal and provide a visual display of the substance content. (Kramer-FIRL)
W76-00576

AUTOMATIC SCUM REMOVAL TROUGH,
Harrisburg Steel Co., Pa.
For primary bibliographic entry see Field 5D.
W76-00578

SWITCHING VALUE FOR CONTINUOUS FILTERING DEVICES,
Agfa-Gevaert, Mortsel (Belgium).
For primary bibliographic entry see Field 8C.
W76-00586

SELF-CLEANING ROTARY FLUID FILTRATION SYSTEM,
For primary bibliographic entry see Field 5D.
W76-00587

DEVICE AND APPARATUS FOR TREATING LIQUIDS SUCH AS DRINKING WATER AND WASTE WATER,
P. Chapsal.
Canadian Patent 973,284. Issued August 19, 1975. Patent Office Record, Vol 103, No 33, p 82, August 19, 1975.

Descriptors: *Waste water treatment, *Water treatment, *Potable water, *Patents, Equipment, Water purification, Pumps.

A device for treating potable and waste water been patented. It comprises a tube which i mersed in the liquid to be treated. The tube is nected at its upper end with treating ga se means. A diffuser having radial vanes fixed rotating disc communicates with the lower e the tube. A pump, positioned under and co with the diffuser, pumps the liquid from the through passages in the disc into chambers de by the vanes. An emulsion of the gas and liq formed in the chambers and then ejected int liquid in the tank. (Orr-FIRL)
W76-00589

CLOSED-LOOP OZONE GENERATING CONTACTING SYSTEM,
H. Lee, and H. M. Rosen.
Canadian Patent 973,285. Issued August 19, Patent Office Record, Vol 103, No 33, p 82, gust, 1975.

Descriptors: *Patents, *Ozone, *Oxy Nitrogen, Carbon dioxide, *Water treatm Recycling, Water purification
Identifiers: Pressure swing fractionator.

A system has been patented by which water c treated with ozone and/or oxygen in a closed cycle. This conserves the high oxygen content A pressure-swing fractionator has the dual f tions of producing the necessary oxygen enri gas for subsequent use and maintaining a nitrogen level throughout the closed loop. fractionator removes nitrogen, carbon dio and water vapor from a feed gas to produce a ygen enriched gas, which then flows to a con tor or an ozonator. The oxygen enriched gas the ozonator contains from about one to s percent ozone. This gas mixture is then conta with water to be treated. Purified wate recovered, and excess oxygen rich gas (no least partially depleted in ozone and/or oxygen enriched in nitrogen) forms a recycle gas whi combined with a charge or air and flowed to pressure-swing fractionator to begin anc cycle. (Kramer-FIRL)
W76-00593

MEASUREMENT OF POWER INPUT IN FL CULATION,
Visvesvaraya Regional Coll. of Engineering, pur (India).
A. G. Bhole, S. M. Dhabadgaonkar, and S. G. Tarnekar.
Journal of the Institution of Engineers (India), 55, Part PH2, p 37-39, February, 1975. 5 fig, 1 11 ref.

Descriptors: *Water treatment, *Floccula *Measurement, Equipment, Turbidity, Analy techniques.
Identifiers: *Speed regulation, *Velocity gradi

In the treatment of water, flocculation is c monly utilized for removal of turbidity. W mechanical mixing is used to achieve floccula a proper coagulant dose is necessary. Velo gradient (change in velocity per unit distance mal to the direction of velocity) has been acce as a rational parameter. It is assumed that the formance of a field flocculator is the same as in an (empirical) jar test of the velocity gradien method used in India is presented for measu mean temporal velocity gradient by the po input technique. The Ward-Leonard metho speed control was used to regulate the speed 220 V dc and 0.75 amp universal motor, to wh the flocculator shaft was attached. (Kramer-FI W76-00608

LARGE RURAL AREA ORGANIZES F POTABLE WATER,
Public Works, Vol 106, No 7, p 48-49, July, 197 fig, 1 tab.

riptors: *Administration, *Water distribu-Applied), *Water supply, *Rural areas, o, Construction, Cost comparisons, ines, Pumping stations, Water costs, *Potable r, *Water districts.
ifiers: Lorain County(Ohio).

w rurlal water district, organized in Lorain ty, Ohio, is one of the largest in the United s to be funded by the Farmers Home Ad-tration (FHA). Formerly, costs of filling a te residential cistern were as high as $65 per h. In August 1973, the Rural Lorain County r Authority was begun in order to integrate rea's water needs with the required financial echnical feasibility data. Public approval was d by the distribution of a question-and-er sheet concerning such matters as adminis-n, project financing, size of mains, amount ater pressure to be provided, and amount of mers' water bills. Following this, hearings eeded smoothly in the 16 political subdivi-. A program of construction was adopted to in August, 1975. Over 350 miles of pipe will id (over 360 sq m) for a distribution system, ding storage and pumping stations to bring ed water from ten miles away at the town of Lake. Estimated costs of constructing the g, service connections, valves, tanks, pump ns and other facilities are detailed; the total e about $11.5 million. A projection of costs to verage Lorain county subscriber indicate that will pay an initial rate of $9.00 per month of gallons of water; the next 2000 gallons will $3.50 per thousand gallons, with $3.00 per sand gallons charged after that. (Kramer-)
-00618

CIFICATIONS FOR GRANULAR FILTER IA,
ersity Coll., London (England).
rimary bibliographic entry see Field 5D.
-00622

US-COMPREHENSIVE WATER OURCES MANAGEMENT,
Corp., New York.
rimary bibliographic entry see Field 5G.
-00623

FLOATING COVER: BEST WAY TO ER A FINISHED-WATER RESERVOIR.
allaire.
Engineering, ASCE, Vol 45, No 6, p 75-79, , 1975. 4 fig.

riptors: *Water distribution, *Water treat-, *Reservoirs, Water pollution control, Pota-water, Construction materials, Installation, tenance, Chlorination, Legislation.
ifiers: *Hypalon floating cover.

water distribution system, the finished-water rvoir should be covered to prevent water ty deterioration due to animal or bird pings, dust and air- borne contaminants, ocarbon exhausts, algal growth, and vandal-About 10% of finished-water reservoirs are covered, but use post chlorination or surveil-as a measure of amelioration. In cities where s decided to cover their reservoirs, the choice between a rigid (Wood, concrete, or alu-m) or floating (Hypalon) cover. The floating r has been chosen in Charleston, South lina; Philadelphia, Pennsylvania; and Chil-ne, Ohio; these systems are detailed. Ad-ages of the floating cover are: low initial ; little maintenance; 100% resistance to ic disturbances; rapid installation; elimina-of evaporation of water or chlorine; elimina-of algae growth as well as taste and odor lems; and, flexibility in that any size or shape rvoir can be covered with a floating cover. e a rigid cover has a longer expected lifetime, its installation and maintenance costs are higher. In a rigid cover system, there is an air space between the water surface and the cover which must be kept well ventilated; in the floating system, the cover moves with the water level, keeping the reservoir water clean, and preventing chlorine and water treatment chemicals from evaporating. Federal pressure and state financial support have been given to cities wishing to cover their finished- water reservoirs, and the floating cover method presents a viable alternative. (Kramer-FIRL)
W76-00624

NATION'S CAPITAL FACES CRITICAL WATER PROBLEM.
For primary bibliographic entry see Field 5D.
W76-00627

HOW BAD IS OUR TAP WATER.
Water and Sewage Works, Reference Number, p R114, R119-R120, April 30, 1975.

Descriptors: *Water treatment, *Potable water, *Water quality control, *Treatment facilities, Personnel, Research and development, Surveys, *Public health, Tastes, Odors, *Vermont.
Identifiers: *Community Water Supply Study(PHS).

The Bureau of Water Hygiene, Environmental Health Service of the U. S. Public Health Service conducted a national Community Water Supply Study (CWSS) during 1969 in eight geographically distributed Standard Metropolitan Statistical Areas and the State of Vermont. The study included 969 water supply systems serving about 18.2 million people. It was designed to assess the status of potable water quality, water supply system facilities, and bacteriological surveillance programs. The principal findings of the study are presented. The results of the study led to eleven specific recommendations; these are also presented. Some of the recommendations include: research to determine the influence of residual organics on the development of tastes and organism regrowth in distribution systems; research to understand what causes problems of appearance or taste in an otherwise safe drinking water; development of a more practical technique for bacteriological surveillance; development of new analytical procedures to tailor treaement to solve a specific taste or odor problem; engineering research to simpligy and lower the cost of reducing the concentration of fluorides and nitrates and other inorganics; development of a continuous monitor for trace metals and corrosion products; monitoring of pressure in strategic locations in water systems; improvement of water systems by installation of adequate pumps, reservoirs and backflow prevention devices; and, enlargement of existing water treatment plant personnel training program. (Orr-FIRL)
W76-00628

CONTROL OF WATER QUALITY IN TRANSMISSION AND DISTRIBUTION SYSTEMS,
Roanoke County Public Service Authority, Salem, Va.
W. L. Rossie, Jr.
Journal of the American Water Works Association, Vol 67, No 8, p 425-427, August, 1975. 7 ref.

Descriptors: *Water distribution(Applied), *Distribution systems, Water conveyance, Water quality control, Baseline studies, Monitoring, Personnel, Operation and maintenance, Stress.

Water utility operators should be able to understand and anticipate stresses on a water distribution system. To control possible adverse effects from such stresses, the operator must prevent exposure, plan for emergency, discover stresses involved and modify conditions with this information, and, understand the interrelationship of variables and how to control them. The external environmental stresses that affect the internal environment of a distribution system include: insufficient treatment at point of procedure; open reservoirs; new construction; line breaks; cross connections; and, disaster operations. Each of these stresses is discussed. Monitoring of a water supply is very important. Tests for alkalinity, taste and odor, pH, turbidity, bacteria, chlorine residual, pressure readings, color, carbon dioxide, hardness, iron, and manganese should be performed to provide a routine check on the quality of water and background values. The use of baseline maps to plot background data quickly identifies abnormal readings that require more investigation. It is concluded that a distribution system is a living functional unit subject to stresses. Quality in design and construction and protective measures depend on quality materials and personnel. Adequate protective means are vital for stabilized operation and quality water in distribution systems. (Orr-FIRL)
W76-00633

EVALUATION OF STATE DRINKING-WATER-QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
D. H. Taylor, and G. D. Hutchinson.
Journal of the American Water Works Association, Vol 67, No 8, p 428-431, August, 1975. 5 tab, 11 ref.

Descriptors: *Water supply, *Water quality, *Water quality control, Potable water, Water quality standards, Public health.
Identifiers: Water supply surveillance.

The important water supply conditions found in the States of Tennessee, Kentucky, Georgia, and Florida were summarized. The state water supply programs that provide for public health and engineering surveillance were also characterized. Three general classes of water supply systems were identified: community water systems; small community water systems; and, private, individual systems. A cross-section of the water supply field in each state was selected for study. The effectiveness of each state's water supply program was determined to a large extent on the bases of potable water quality, adequacy and condition of water system facilities, and water supply surveillance. The data showed great similarity between the status of the water supply field in the four states. Public health surveillance in the four states was not adequate to ensure continuous, safe drinking water. Lack of engineering inspection of system facilities was another common failure. Water system operation was found to be deficient in all states evaluated. Those facilities staffed with trained and certified operators were better water systems. Failure to maintain a chlorine residual throughout the distribution system was a common problem. It is concluded that the state legislatures, the administrative levels of state government, and the water supply field need to make strong commitments to restore and widen the margins of safety that water supplies provide in the southeast U. S. Safe and adequate water supplies will depend on the use of higher water utility service standards and regulation, surveillance, and enforcement by public environmental protection control agencies.(Orr-FIRL)
W76-00634

DESALTERS SOW SEEDS FOR SAUDI INDUSTRY.
For primary bibliographic entry see Field 3A.
W76-00636

ORGANIC CONTAMINANTS IN WATER SUPPLIES.
American Water Works Association, New York. Committee on Organic Contaminants.
For primary bibliographic entry see Field 5A.
W76-00647

LIBRARY U. OF I. URBANA-CHAMPAIGN

ION EXCHANGE WATER TREATMENT,
French Patent 2187-703. Issued February 22, 1974. French Patents Abstracts, Vol. 5, No. 11, February, 1974.

Descriptors: *Patents, *Ion exchange, *Demineralization, Automation, Beds, *Water treatment, Streams, *Water softening, Desalination.
Identifiers: Resins beds, Ion exchange plants.

An ion exchange plant for softening and demineralizing water is described. Part of the resin bed is periodically set aside for regeneration and then returned to the bed. Water for treatment is directed down through a first section of the resins bed, then turned and redirected up through a second section, at the top of which resin can be separated off for regeneration. Subsequently it is reintroduced at the top, upstream end of the first section. Even when fully automated, this plant does not require complex controls. (Prague-FIRL)
W76-00850

CARCINOGENS COMPLICATE CHLORINE QUESTION,
For primary bibliographic entry see Field 5B.
W76-00946

FLUORIDE POLLUTION,
National Research Council, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-00975

5G. Water Quality Control

CITIZEN ENFORCERS: INFLUENCING WATER RESOURCES ALLOCATION DECISIONS,
Georgia Inst. of Tech., Atlanta. Inst. of Government.
J. O. Smith.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 199, $8.75 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC1175, August 1975, 283 p, 2 append. OWRT A-044-GA (1). 14-31-0001-4010.

Descriptors: *Water law, Water quality standards, Water pollution, Common law, *Federal Water Pollution Control Act, *Georgia, *Social participation, Decision making, *Public rights, Administrative decisions, Land use, Planning.
Identifiers: Federal water law, Georgia water law, Effluent standards, Administrative law, Legal standing, Citizen suits, Rulemaking, Private attorney general, *Public participation, Public interest.

The public citizen is portrayed in the context of his or her function as a private attorney general or enforcer of water resources protection statutes. Opportunities for this kind of involvement, derived primarily from the Federal Water Pollution Control Act Amendments of 1972, are listed and explained. Common law actions which are avialable to protect Georgia's Water resources are summarized both to demonstrate the vaibility of this source of water quality protection and to reveal its inadequacies and weaknesses, which modern statutes are designed to cure. Technical language, that is, legal jargon, has been eliminated through paraphrasing wherever possible to ennance the value of the report to lay audience to whom it is primarily directed. Federal and state administrative procedure statutes are explained, with emphasis on provisions of most significance to citizens. A summary and explanation of the most important provisions of the Federal Water Pollution Control Act Amendments of 1972 and regulations adopted under it form the major part of the report. A practical view of state administrative procedure is presented in the context of a discussion of the Georgia Coastal Marshlands Protection Act of 1970.
W76-00505

ASSESSMENT AND DEVELOPMENT PLAN FOR MONITORING OF ORGANICS IN STORM FLOWS,
Raytheon Co., Portsmouth, R.I.
For primary bibliographic entry see Field 5A.
W76-00507

WATER QUALITY STUDIES.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Programs
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 586, $11.50 in paper copy, $2.25 in microfiche. Report EPA-430/1-74-007, May, 1974. 446 p.

Descriptors: *Water pollution control, *Water quality control, Training, *Surveys, Water pollution sources, Bioassays, Bacteria, Bioindicators, Chemical analysis, Water analysis, Analytical techniques, Statistics, Aquatic life, Data collections, On-site data collections.
Identifiers: Water pollution surveys, *Training manuals(Water pollution).

This training manual is designed for persons having responsibilities for planning and working in water pollution surveys. The chapter on sources of pollutants covers the pollutional characteristics of domestic waste waters, the sources and effects of industrial wastes, the influence of land runoff on water quality, irrigation return flow and agricultural runoff, and an overview on thermal pollution. Planning and conducting water quality surveys is explained in terms of organizing a stream survey, organizing a lake or impoundment survey, flow measurement, tracing natural water, sampling, sample handling, bacterial sampling, and the role of the bacteriologist in water quality surveys. The section on data handling and reporting includes: introduction to statistics; presentation of data; presentation and interpretation of bacteria data; preparation of survey reports; and the EPA Storet system. The aquatic environment, the identification of aquatic organisms, using benthic biota in water quality evaluation, biological field method, special applications and procedures for bioassay, and aquatic organisms of significance in pollution surveys are covered in the section on aquatic biology. The chemistry section explains the common water analysis tests. Bacteriological indicators of water pollution, analysis of coliform and fecal streptococcus groups, determination of bacterial pollution, and membrane filter techniques are discussed in the section on bacteriology. Dissolved oxygen and oxygen relationships are the topic of another section. Aerial reconnaissance in pollution surveillance and case preparation and courtroom procedure are also discussed. (Orr-FIRL)
W76-00513

BIBLIOGRAPHY OF HYDROLOGY, CANADA, 1971-1973.
International Association of Hydrological Sciences, Ottawa (Ontario).
For primary bibliographic entry see Field 10C.
W76-00532

HYDROLOGY AND WATER RESOURCES, A SYLLABUS OF REFERENCES FOR TEACHING INTRODUCTORY COURSES IN THE WATER ENVIRONMENT.
National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 10C.
W76-00536

EROSION IN THE URBAN ENVIRONMENT,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 2J.
W76-00546

SALINITY POLICY FOR COLORADO R BASIN,
Colorado State Univ., Fort Collins. De Agricultural Engineering
G. V. Skogerboe, and W. R. Walker
Journal of the Hydraulics Division, Proceed American Society of Civil Engineers, Vol 1 HY8, Paper 11510, p 1067-1075, August 197 13 ref, append.

Descriptors: *Salinity, *Water m ment(Applied), *Water policy, *Water control, *Colorado River basin, *Return Strip mines, Irrigation, Saltation, Colorado compact, Mexican water treaty, State g ments

Salt concentration and pickup by water, flow the Colorado River basin, creates problem areas in the lower basin. The water quality g the Colorado River of maintaining salinity co trations in the lower stem at or below p levels (nondegradation salinity policy) ha siderable merit, because specific contract treaties guarantee water quantities to states basin and to Mexico. The nondegradation s policy should be applied to each state, n setting numerical standards, but by offs salinity detriments resulting from each development with salinity control measure will maintain a net salt leaving state bound Salinity detriments from one water-use (e.g., coal strip mining or oil shale develop could be mitigated by investing in salinity c measures in another water-use sector (e.g provements in existing irrigation systems). A ble state policy will result in improved management that will facilitate water de ment. (Lardner-ISWS)
W76-00553

PREDICTION OF ASSIMILATION CAPA IN RECEIVING STREAMS, PART I,
Oklahoma State Univ., Stillwater. Dept. of Engineering.
For primary bibliographic entry see Field 5B.
W76-00600

PREDICTION OF ASSIMILATION CAPA IN RECEIVING STREAMS, PART II,
Oklahoma State Univ., Stillwater. Dept. of Engineering.
For primary bibliographic entry see Field 5B.
W76-00601

GREEN BAY SELF-PURIFIES AL NUTRIENTS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W76-00615

USING HYDROGEN PEROXIDE FOR PO TION CONTROL.
For primary bibliographic entry see Field 5D.
W76-00616

SALINITY CONTROL AND FEDERAL WA QUALITY ACT,
Bureau of Reclamation, Denver, Colo. W Quality Office.
M. B. Bessler, and J. T. Maletic.
Journal of the Hydraulics Division, Proceedin ASCE, Vol 101, No HY5, p 581-594, May, 19 fig, 1 tab, 17 ref, 1 append.

Descriptors: *Saline water, Saline water intru Rivers, Administration, Refining, Sali Legislation, Water quality control, Water su *Water quality act, Water pollution control.
Identifiers: *Colorado River Water Quality provement Program(CRWQIP), *Salinity cont

ity is considered as a chemical or mineral pol-
t under the Federal Water Quality Act and is
ving increased attention in the western U.S.
ity and the adequency of basin water supplies
ecoming a major economic issue in the
rado River Basin. The overall planning strate-
the Colorado River Water Quality Improve-
Program (CRWQIP) and some of its inherent
ations in meeting water quality goals are
ssed. The Colorado River International
ity Control Project is a comprehensive effort
h demonstrates that salinity control planning
consider many complex interrelated factors
natural hydrologic variations and man-made
ges to internation relations and legislation
cting public policy. The five categories of
ol that are presently being studied under the
QIP include: river system management;
source control; diffuse source control; irriga-
source control; and, return flow utilization. If
vater resource development is attained, then
oint and diffuse source controls as identified
e CRWQIP will not be sufficient to meet
ity objectives established by the states and
PA. Planning will be directed toward a Total
r Management concept which involves the
wing: integrating water resources manage-
and land-use planning; planning and con-
ng of interrelated structures and physical fea-
; examining and evaluating the existing
ms, institutions, and legal requirements; dis-
ng alternative plans to examine quality and
tity impacts within a river basin; and, deriving
ient operational and management modes for
ver system. (Orr-FIRL)
-00617

IRONMENTAL ASPECTS--SACRAMENTO
K PROTECTION,
y Engineer District, Sacramento, Calif. Water
urces Planning Branch.
rimary bibliographic entry see Field 4D.
-00621

US-COMPREHENSIVE WATER
OURCES MANAGEMENT,
Corp., New York.
Kohlhaas.
r and Sewage Works, Vol 122, No 6, p 70-75,
1975. 1 fig, 7 ref.

riptors: Water resources, *Water resources
lopment, *Administration, *Comprehensive
ing, Water supply, Alternate planning, Alter-
e water use, *Hydrologic cycle, Water
ly, Water treatment, Waste water treatment,
ct planning.
ifiers: Generalized water balance diagram.

increasing demand for water supply and con-
for pollution-free receiving waters require a
rehensive approach to the planning of water
rces. A generalized water balance diagram is
key to comprehensive planning. Concepts
asized include non-point source pollution
ems. The diagram is based on the natural
ological cycle that begins with precipitation,
ff, and evaporation to the atmosphere, lead-
precipitation and a repeat of the cycle, and
e cycle of the use of water resources by man,
degradation through use, and their reclama-
and ultimate reuse. The purposes of the dia-
are: to provide general guidelines for water
rces and environmental planning; to identify
fic optionf for meeting water supply, waste
sal, and waste water reclamation goals; and,
ovide for the evaluation of specific water
rces alternatives. The generalized water
ce diagram consists of several systems and
stems: available supply system; surface
m system; evaporation; water supply and
disposal system; water use-reuse system;
dwater system; reservoir system:
stems of water supply sources; subsystem of
ge; water treatment subsystem; waste water
ment subsystem; flood retention sybsystem;
recreational impoundment subsystem; industrial use subsystem; and, miscellaneous use subsystem. The use of the diagram is illustrated by several examples. (Orr-FIRL)
W76-00623

TROUBLE IN PARADISE,
Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.
H. E. Schwarz, and M. R. Eigerman.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 101, No HY5, p 603-612, May, 1975. 3 tab.

Descriptors: *Water quality control, *Water management(Applied), Administration, Water pollution control, *Massachusetts, Public benefits, Engineering, Environmental effects, *Planning, Social impact.
Identifiers: Merrimack Valley(Mass).

Overall planning problems for water quality control and waste water management are discussed. Social impacts are difficult to evaluate, and rather than a behind the desk data-gathering process, the Merrimack Wastewater Management Study was undertaken by interviewing local people in 15 surrounding towns and cities in this rural Massachusetts area. A matrix chart was used to record local issues and concerns, which was divided into vertical columns of 'plan actions' and horizontal rows of 'impact categories.' The plan actions were: water quality; water quantity; water supply; collection systems; treatment residuals; planning and design; construction; land modification; capital cost funding; private abatement actions; and operations. The 18 impact categories included: population; commercial fisheries; employment; housing; recreation; land use; municipal services; municipal finances; political process; and public health. The study of the Merrimack Valley area was designed to inventory the local people for their problems and needs; to translate the messages received from the matrix into engineering terms so as to get feedback from the citizens as to the most important issues; to compare the matrices for all 15 surrounding communities; and to make and implement real engineering and management alternatives. (Kramer-FIRL)
W76-00625

NATION'S CAPITAL FACES CRITICAL WATER PROBLEM.
For primary bibliographic entry see Field 5D.
W76-00627

THE FEDERAL CONSTRUCTION GRANT PROCESS FROM A (BILENE) TO Z (ANESVILLE),
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
J. T. Rhett.
Water and Sewage Works, Reference Number, p R20, R22-R24, R27-R28, April 30, 1975. 5 fig.

Descriptors: *Waste water treatment, *Financing, *Government finance, *Grants, Local governments, State governments, Legislation, Costs, Planning, Federal Water Pollution Control Act, *Treatment facilities.
Identifiers: PL 92-500, Federal Water Pollution Control Ace Amendments.

The ground rules for the investment of public funds for sewers and treatment facilities are primarily set forth in the regulations published in the Federal Register in February of 1974. However, the procedural requirements are only broadly sketched. The step by step activities of applying for federal funds are explained in this article. A rough outline of each step is presented in flow chart form. The steps include: preapplication activity; step one or facility planning which takes from 6 to 12 months; step two or facility design which takes from 6 to 12 months; step 3 or construction which takes from 2 to 4 years; and operation and maintenance which continues for the plant life or 25 to 30 years. The following types of Federal aid are available: grants for various planning activities; technical assistance, especially for facility design and construction and for enforcement; technical information from Federal research, demonstration and monitoring; training for State and local personnel; and environmental Financing Authority to help local governments raise their share of the costs of treatment facilities; and, a larger Federal share of costs to a uniform 75 percent. (Orr-FIRL)
W76-00629

ESTIMATING INDIRECT COST OF URBAN WATER USE,
Koebig and Koebig, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3D.
W76-00630

FINLAND'S CLEANUP CAMPAIGN,
J. Josephson.
Environmental Science and Technology, Vol9, No 8, p 710-711, August, 1975.

Descriptors: *Water pollution control, *Pollution abatement, *Legislation, *Financing, Pulp and paper industry, Biochemical oxygen demand, Phosphorus, Nitrogen, Industrial wastes, Municipal wastes, Energy, Monitoring, Water quality control, Standards.
Identifiers: *Finland.

The International Bank for Reconstruction and Development has granted a 15 yr loan of $20 million to finance a water pollution control program in Finland. This is the first pollution control loan ever granted by the World Bank. The water consumption and waste water production per capita in Finland are among the highest in the world, due to the large forest products and pulp and paper industries. Water protection is generally regarded as having the highest priority in the field of environmental pollution control in Finland. Finnish authorities spend about $56 million/yr on municipal waste water treatment. Within the next five years, 90% of the municipal waste water should be effectively cleaned. Water use and cleanup in Finland are regulated by its Water Act of 1961, which prohibits blocking, changing, or spoiling water courses without a permit. The National Board of Waters is administering a cleanup program that stresses BOD7, phosphorus, and nitrogen. The NBW conducts a monitoring program for discharges and ambient water quality. About 15 consulting firms are approved by the NBW to perform monitoring work for individual industries. The only environmental standards in Finland are those for water. An Air Protection Act and a Noise Abatement Act are being drafted by the Ministry of the Interior's Division for Environmental Protection. A Waste Management Act is also beind drafted. Laws concerning oil damages, environmental poisons, and biocides are already in force. Projects to recover and use waste heat from industry to provide space heating for buildings are examples of Finland's philosophy that the more completely fuel, materials, and heat are used, the less waste matter and energy are left to pollute. (Orr-FIRL)
W76-00631

CONTROL OF WATER QUALITY IN TRANSMISSION AND DISTRIBUTION SYSTEMS,
Roanoke County Public Service Authority, Salem, Va.
For primary bibliographic entry see Field 5F.
W76-00633

A STRATEGY FOR WATER POLLUTION CONTROL IN BRITAIN,
For primary bibliographic entry see Field 5D.
W76-00638

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OTTAWA PLAYS KEY ROLE IN TECHNOLOGY TRANSFER,
Environmental Protection Service, Ottawa, (Ontario).
For primary bibliographic entry see Field 5D.
W76-00643

A FOURTH DIMENSION--RECREATION AND AMENITY,
For primary bibliographic entry see Field 6B.
W76-00644

THE REVOLUTION IN WATER MANAGEMENT,
R. C. Rittenhouse.
Power Engineering, Vol 79, No 8, p 28-35, August, 1975. 2 fig, 2 tab.

Descriptors: *Water management(Applied), *Power system operation, *Water reuse, Legislation, Federal Water Pollution Control Act, Environmental effects, *Cooling towers, Thermal power, Thermal pollution, Water pollution control.
Identifiers: *Closed-cycle colling system.

Water management and its influence on all aspects of power generation is discussed. Because of the Federal Water Pollution Control Act Amendments of 1972, all new plants must conform to EPA guidelines or must convert to a closed-cycle cooling system. The field of environmental management is rapidly growing, and a multidisciplinary staff includes: chemists, biologists, meteorologists, physicists, mathematicians, and socioeconomists, as well as civil, mechanical, and chemical engineers. With this approach, the functions of cost-benefit analyses and the solving of specific technical problems may best be implemented. Industry objections to the new EPA guidelines have been that stringent legislation fails to recognize differences in the location, design and requirements for the operation of individual power plants. The largest protesting group was the Utility Water Act Group (UWAG), which opposed most strongly the guidelines for thermal effluents. Costs versus benefits of control measures are discussed, and a possible change in water pollution control policies which might take place between the 1977 and 1983 compliance deadlines is recommended. Specific problems of various facilities, including dry and hybrid cooling towers, cooling ponds and lakes, and spray ponds and canals are detailed. Also considered are new business opportunities in water and waste management, as a result of new applications of reuse. (Kramer-FIRL)
W76-00648

STORM WATER MANAGEMENT MODEL: DISSEMINATION AND USER ASSISTANCE,
University City Science Center, Philadelphia, Pa.
J. A. Hagarman, and F. R. S. Dressler.
Environmental Protection Agency, Report EPA-670/2-75-041, May 1975. 46 p, 23 fig, 13 tab, 10 ref, append. 1BB034 ROAP: ATA Task 020. R-802716.

Descriptors: Water quality control, Mathematical Models, Rainfall, Surface runoff, Waste water treatment, Erosion control, Water pollution, Control, Storm water, Model studies, *Information exchange, Computer programs, Data storage and retrieval, Computer models.
Identifiers: Stormwater management, Urban stormwater, *Storm water management model.

A program of dissemination and user-assistance for the EPA Storm Water Management Model (SWMM) has been developed and implemented. Services available to SWMM users include distribution of the SWMM program itself and technical assistance in problem delineation, data preparation, execution debug, and output interpretation. Costs of this service extend only to actual computing costs. Several case studies of SWMM applications completed with UCSC assistance in the past year included in this report. These studies include a combined sewer overflow problem in Binghamton, New York; a land use plan in the Stony Brook basin in Princeton, New Jersey, and RUNOFF/TRANSPORT calculations on the Wingohocking basin in Philadelphia, Pennsylvania. The UCSC SWMM dissemination program is now self sustaining and continues to assist the user community. (EPA)
W76-00678

FLOW ESTABLISHMENT AND INITIAL ENTRAINMENT OF HEATED WATER SURFACE JETS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 5B.
W76-00679

ACQUISITION AND CULTURE OF RESEARCH FISH: RAINBOW TROUT, FATHEAD MINNOWS, CHANNEL CATFISH, AND BLUEGILLS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
J. L. Brauhn, and R. A. Schoettger.
Available from the National Technical Information Service Springfield, Va 22161. Environmental Protection Agency Report EPA-660/3-75-011, May 1975. 45 p, 4 tab, 83 ref. 1BA021. EPA-LAG-0153(D).

Descriptors: *Freshwater fish, *Quality control, Feeding rates, Water quality, *Rainbow trout, *Channel catfish, Fish diseases, Pesticide residues, Water quality control, Water pollution control.
Identifiers: *Fathead minnows, Bluegill sunfish, Genetic stocks.

Rainbow trout (Salmo gairdneri), channel catfish (Ictalurus punctatus), fathead minnows (Pimephales promelas), and bluegills (Lepomis macrochirus) are cultured widely for toxicological research. However, vacillant or extreme cultural conditions are sometimes suspected of comprising the test animals and, thus, results of comparative or confirmatory research. Because exact optimum conditions for indoor maintenance and culture of the four species are not well defined, standardized practices were adopted that are intended to reduce cultural conditions to a common variable status. Water quality, nutrition, genetic variation, diseases, fish handling, gross behavior, and required facilities are discussed. Well known propagation techniques provide the basis for the intensive care methods used. Special emphasis is given to diets, diet preparation, and residues of pesticides or other contaminants in diets and fish. (EPA)
W76-00680

EVALUATION OF HEALTH HAZARDS ASSOCIATED WITH SOLID WASTE/SEWAGE SLUDGE MIXTURES,
East Tennessee State Univ. Johnson City, Tenn. Dept. of Health Sciences.
For primary bibliographic entry see Field 5E.
W76-00681

ADVANCED AUTOMATIC CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE TREATMENT PROCESS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-00693

REHABILITATION OF LAND DISTURBED BY SURFACE MINING COAL IN ARIZONA,
Arizona Univ. Tucson. Dept. of Watershed Management.
T. R. Verma, and J. L. Thames.
Journal of Soil and Water Conservation, Vol 30, No 3, p 129-131, May-June, 1975. 3 fig, 5 tab, 5 ref.

Descriptors: *Strip mines, *Revegetat *Landscaping, *Arid lands, *Land reclamat *Arizona, Coal mines, Land forming, Contc Erosion control, Land management, Vegeta establishment, Watershed management, Con vation, Ranges, Hydrology, Erosion Slo Range management, Grazing, Range grasses, conservation, Soil moisture, Water quality.
Identifiers: Surface coal mining, L disturbance, Recontouring, Black Mesa(Ariz).

Preliminary results are presented of a study on effects of mining operations on mined a hydrology and the effectiveness of reclamation forts in the southwest. Water is the factor determines how well disturbed lands can be re bilitated. The problem is maximizing the vantages and minimizing the threat of eros Recontouring mined land results in land which a greater soil depth and a high hydrologic po tial. The reclaimed watershed also has great po tial, not only for erosion control and restoratio the landscape to its original condition, but also use as rangeland. If proper grazing practices be maintained, preliminary results indicate lo lasting and productive rehabilitation can achieved on Black Mesa's disturbed watershe (Robinett-Arizona)
W76-00709

ANIMAL WASTE MANAGEMENT WITH PO LUTION CONTROL.
Ohio Agricultural Research and Developm Center, Annual Report, NC-93 October 1974, 2 9 fig, 12 tab, 6 ref.

Descriptors: *Lagoons, Economics, *Od *Ohio, Soils, Agricultural runoff, *Farm wast Hogs, Rates of application, Groundwater, Wa quality, Water pollution control, Waste disposal
Identifiers: Waste management, *Composti *Land disposal.

The Agricultural Engineering Department c tinued to evaluate handling swine waste w flushing and a two stage lagoon system. Expe mental objectives were: to determine the tre ment efficiency of the system, measure nitrogen losses in each unit, determine whet ground water pollution occurs from the lagoo and to evaluate the system with respect to equ ment system effectiveness, and economics. another experiment, a built-up bed, aerobic co poster was designed to provide both treatment a storage capability. Evaluations of rate of applic tion, type and condition of manure, temperatur achieved within the composting mass and resulta compost quality and condition are in progre Other projects underway include livestock was systems and studies of malodorous substances a their abatement. The Agronomy Department h installed field lysimeters to determine the ma imum rate of cattle manure that can be applied various Ohio soil types without adversely affec ing groundwater quality. Cooperative research h been initiated through a Memorandum of U derstanding between the Ohio Agricultur Research and Development Center and USDA ARS-North Appalachian Experiment Watershed, Coshocton, Ohio. Numero watersheds are available to study runoff fro pastures and feedlots. Cow herds will be manage under 3 systems: (1) limited stocking rate and fe tilizer application with grazing during the growi season only; (2) high stocking rate and fertiliz application with year-long grazing and; moderate fertility and stocking rate with hay fe on pasture during winter. Cattle will be fed drylot with varying proportions of concentrate and roughages. Runoff, ground water and so sediments will be analyzed for N, P, K, BOD, et where applicable. (East Central Oklahoma State)
W76-00714

AGRICULTURAL WASTE MANAGEMENT,
American Society of Civil Engineers, New York Environmental Engineering Div.

l of the Environmental Engineering Divi-
American Society of Civil Engineers, Vol
o EE1, p 1-6, February, 1974. 1 fig.

ptors: *Return flow, *Waste
Pollution), Wastes, Agriculture, Irrigation,
ion practices, Irrigation effects.

the practice of irrigation has detrimental ef-
n water quality, irrigation return flows must
nsidered an agricultural waste. The major
quality problem is increased salt concentra-
the return flows as a result of the pickup of
ls from the soils and the loss of water
h evapotranspiration. Irrigated agriculture is
rgest consumer of water resources, and
flows constitute a large portion of the flow
ny western streams. Salt concentrated by
ranspiration must be leached from the root
o continue crop production. This necessity
hing to maintain a salt balance concentrates
n the return flows and causes damage
tream. (Skogerboe-Colorado State)
0744

ENERAL PLAN FOR THE URBAN
LOPMENT OF MOSCOW AND TASKS
TED TO WATER HYGIENE AND SANI-
PROTECTION OF WATER RESER-
S (GENERAL' NYY PLAN RAZVITIYA
VY I ZADACHI GIGIYENY VODY I
'ARNOY OKHRANY VOKOYEMOV),
imary bibliographic entry see Field 5D.
0783

TO MUNICIPALITIES FOR WATER
LY, POLLUTION ABATEMENT AND
R SEPARATIONS.
imary bibliographic entry see Field 6E.
0789

SHORTEST TIME SEQUENCE OF HEAVY
FALL AND ITS EFFECT ON STORM-
ER RETENTION TANKS (DIE KUER-
E ZEITFOLGE VON STARKREGEN UND
AUSWIRKUNG AUF REGENBECKEN),
imary bibliographic entry see Field 2A.
0798

UATION OF SURFACE WATER
URCES FROM MACHINE-PROCESSING
RTS MULTISPECTRAL DATA,
a State Univ., Terre Haute. Dept. of Geog-
and Geology.
Mausel, W. J. Todd, M. F. Baumgardner, R.
chell, and J. P. Cook.
l of Environmental Quality, Vol 3, No 4, p
1, October-December, 1974. 5 fig, 1 tab.

iptors: *Water pollution control, *Water pol-
, Water management, Water quality, Water
y control, Environmental control, Monitor-
ydrology.
fiers: *Earth Resources Technology Satel-
ultispectral scanner.

resource data that are useful to environ-
l scientists and planners frequently are
g, incomplete, or obtained irregularity. A
ource of surface hydrological information
obtained as often as every 18 days in some
through machine-processing of Earth
rces Technology Satellite (ERTS) mul-
tral scanner data. This research focused on
rface water resources of a large metropolitan
Marion County (Indianapolis), Indiana, in
to assess the potential value of ERTS spec-
nalysis to water resources problems. The
s of the research indicate that all surface
bodies over 0.5 ha were identified accurately
ERTS multispectral analysis. Five distinct
s of water were identified and correlated
arameters which included the (1) degree of
siltiness; (2) depth of water; (3) presence of
macro and micro biotic forms in the water; and (4) presence of various chemical concentrations in the water. (Skogerboe-Colorado State)
W76-00833

NERC 74, ANNUAL REPORT.
National Environmental Research Center, Cincinnati, Ohio.
EPA Report, EPA-670/9-75-002, March 1975. 98 p, 93 fig, 8 tab, 9 ref.

Descriptors: *Research and development, *Waste treatment, *Federal government, Research facilities, Projects, Investigations, Waste water (pollution), Waste water treatment, Wastes, Solid wastes, Hazards, Pollutants, Water pollution, Environmental effects, Environmental control, Water supply, Water resources, Waste disposal, Sewage treatment, Industrial wastes, Toxicity, Air pollution, Laboratory tests, Analytical techniques, Heavy metals, Oil spills, Mine wastes, Recycling, Quality control, Methodology, Asbestos, Leachate, Control.

The budget, staff, programs and activities, and facilities of the National Environmental Research Center (NERC) in Cincinnati were described in the 1974 annual report. Included were reports on functions and projects of NERC research laboratories, including Advanced Waste Treatment, Environmental Toxicology, Industrial Waste Treatment, Methods Development and Quality Assurance, Solid and Hazardous Waste, and Water Supply. Other current studies described were: (1) binding of heavy metal pollutants by polyuronic acids, (2) use of coal mine refuse and fly ash as a road base material, (3) identification of organic pollutants with computerized gas chromotography/mass spectrometry, (4) control of landfill leachate by biological treatment methods, and (5) asbestos in drinking water. (Robinson - ISWS)
W76-00879

THE BOUNDARY WATERS TREATY OF 1909: DOES IT PROVIDE AN ENVIRONMENTAL CAUSE OF ACTION,
For primary bibliographic entry see Field 6E.
W76-00926

CITIZEN SUITS SPUR COURT PROBES OF ENVIRONMENTAL IMPACT.
For primary bibliographic entry see Field 6E.
W76-00956

RIVER DEFENSE COMMITTEE V. THIERMAN (ACTION UNDER NEPA TO COMPEL A PUBLIC HEARING BEFORE ISSUING PERMIT).
For primary bibliographic entry see Field 6E.
W76-00980

BOONE V. TILLATOBA CREEK DRAINAGE DISTRICT (SUIT SEEKING INJUNCTIVE RELIEF WITH RESPECT TO PROPOSED DRAINAGE PROJECT).
For primary bibliographic entry see Field 6E.
W76-00981

GARDINIER, INC. V. FLA. DEPT. OF POLLUTION CONTROL (PETITION FOR WRIT OF CERTIORARI TO DETERMINE THE VALIDITY OF AN ORDER OF THE DEPARTMENT OF POLLUTION CONTROL).
For primary bibliographic entry see Field 5B.
W76-00982

LEGAL ASPECTS OF PHOSPHATE MINING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6G.
W76-00984

TANKERS AND THE MARINE ENVIRONMENT, PART I.
For primary bibliographic entry see Field 5B.
W76-00985

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN, MACRO MODEL SIMULATION.
Washington Univ., Seattle, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-00503

STUDIES ON OPERATIONS PLANNING AND CONTROL OF WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc., Palo Alto, Calif.
D. W. Bree, Jr., A. I. Cohen, L. C. Markel, and H. S. Rao.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 198, $5.75 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 128p, 36 fig, 30 ref. OWRT C-5214(No 4212) (1). 14-31-0001-4212.

Descriptors: *Distribution systems, *Simulation analysis, Operations, Planning, *Control, *Optimization, Pumping, Networks, *Water allocation(Policy), *Model studies.
Identifiers: *Operations planning, Network analyses.

The studies were conducted in three parts. In the first part, a field experiment was performed to validate a model for extended period simulation of water distribution systems. The experiment and its results are discussed. In the second part, a three level hierarchical model was developed for operations planning and control of water distribution systems. The three levels, namely the monthly, daily and the hourly level, address source or pump scheduling with a shorter time horizon, but on a more detailed and refinde system model. The monthly and daily models provide support to the hourly model in determining set points for pump source scheduling. Each model is of direct use in its own right for operations planning. Preliminary numerical results are presented for optimizing pumping operation in the system using an experimental code. The thrid and final part presents preliminary results on reduced order representations of distribution networks. (See also W74-05533)
W76-00506

URBAN STORMWATER MANAGEMENT MODELING AND DECISION-MAKING,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W76-00695

THE ROLE OF GROUNDWATER IN THE OPTIMUM UTILIZATION OF WATER RESOURCES,
Guadalquivir Project, Madrid (Spain).
For primary bibliographic entry see Field 4B.
W76-00815

MODELS FOR GROUNDWATER ANALYSIS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 4B.
W76-00816

LIBRARY U. OF I. URBANA-CHAMPAIGN

SIMULATION MODELS FOR CONJUNCTIVE USE OF SURFACE AND GROUNDWATER,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 4B
W76-00817

APPLICATION OF SYSTEMS ANALYSIS MODELS TO THE PROBLEM OF CONJUNCTIVE USE OF SURFACE AND GROUNDWATER IN THE VEGA OF GRANADA,
Instituto Geologico y Minero de Espana, Madrid.
For primary bibliographic entry see Field 4B.
W76-00818

COMPUTATION OF ECONOMIC DATA CONCERNING THE EXPLOITATION OF GROUNDWATER ON A REGIONAL SCALE,
Northern Sahara Water Resources Study Project, Alger (Algeria).
For primary bibliographic entry see Field 4B.
W76-00819

SOME ASPECTS OF GROUNDWATER EXPLOITATION AND THE USE OF GROUNDWATER MODEL IN THE MIRES BASIN IN CRETE, GREECE.
For primary bibliographic entry see Field 4B.
W76-00820

SYSTEM FOR EXPLOITATION OF THE 'COMMON HERITAGE OF MANKIND' AT THE CARACAS CONFERENCE,
Ministry of Foreign Affairs, Nairobi (Kenya). Legal Div.
A. O. Adede.
American Journal of International Law, Vol 69, No 1, p 31-49, 1975. 35 ref.

Descriptors: *United Nations, *Law of the Sea, *Negotiations, *International law, United States, Oceans, Political aspects, Legal aspects, Federal government, Administrative agencies, Governmental interrelations, Exploitation, Exploration, Mining, Treaties, Underwater, International waters.
Identifiers: *International agreements, *Seabeds.

The work of the First Main Committee of the Third United Nations Conference on the Law of the Sea is examined, with particular emphasis on the proper system of exploitation and exploration of the seabed beyond the limits of national jurisdiction. The center of attention is draft Article Nine, entitled 'Who May Exploit the Area', several formulations of which had been drafted in preparation for the Conference. The delegates' negotiations on Article Nine, they exemplify the divergent positions of developed and developing nations on issues concerning exploitation of the deep seabed and subsoil. Major issues at the Conference included: (1) whether there should be a single or multiple system of exploitation and exploration of seabed; (2) the proper role to be played by the proposed International Sea-bed Authority, and the degree of control which the Authority should be permitted to exercise over such activities; and (3) whether detailed rules and regulations concerning seabed activities should be written into the proposed Convention itself, as opposed to incorporating only a framework of general norms to guide the Authority. Recommendations are presented for future discussions, and an alternative text is proposed. (Schilling-Florida)
W76-00933

STATE OF OHIO EX REL. BROWN V. CALLAWAY (ACTION BY STATE TO ENJOIN CONSTRUCTION OF TWO RESEARVOIRS).
For primary bibliographic entry see Field 6E.
W76-00951

PIERCE V. RILEY (ACTION BY RIPARIAN OWNERS FOR INJUNCTION TO PROVIDE ACCESS TO LAKE).
For primary bibliographic entry see Field 4A.
W76-00976

CHIPOLA NURSERIES, INC. V. DIVISION OF ADMINISTRATION, DEPARTMENT OF TRANSPORTATION (APPEAL OF EMINENT DOMAIN PROCEEDING FOR VIOLATION OF NEPA).
294 So. 2d 357 (Fla App 1974)

Descriptors: *Eminent domain, Condemnation, *Right-of-way, *Economics, *Judicial decisions, Environmental effects, Florida, Legislation, Environment, Highway effects, Environmental control, Ecology, Alternate planning, Project planning, Management, Water resources development.
Identifiers: *National Environmental Policy Act, *Florida Air and Water Pollution Control Act.

Certiorari was sought in the First District Court of Appeal to review an order of taking entered in an eminent domain proceeding by the lower court. The petitioners alleged that the Department of Transportation failed to properly consider the costs, environmental factors, area planning, and alternate routes to the right of way granted and that the respondent has failed to comply with the National Environmental Policy Act (NEPA) of 1969 and with the Florida Air and Water Pollution Control Act (FAWPCA). The court held that the actions by the Department of Transportation did not constitute an oppressive exercise of its authority and that the evidence failed to establish any violation of the NEPA, the FAWPCA or the Federal Aid Highways Act. (Proctor-Florida)
W76-00979

RIVER DEFENSE COMMITTEE V. THIERMAN (ACTION UNDER NEPA TO COMPEL A PUBLIC HEARING BEFORE ISSUING PERMIT).
For primary bibliographic entry see Field 6E.
W76-00980

BOONE V. TILLATOBA CREEK DRAINAGE DISTRICT (SUIT SEEKING INJUNCTIVE RELIEF WITH RESPECT TO PROPOSED DRAINAGE PROJECT).
For primary bibliographic entry see Field 6E.
W76-00981

6B. Evaluation Process

HYDROLOGY FOR ENGINEERS AND PLANNERS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-00531

AN OCEANOGRAPHIC RESEARCH PROGRAM FOR THE CONTINENTAL SHELF OFF THE SOUTHEASTERN UNITED STATES.
Division of Biomedical and Environmental Research (USERDA), Washington, D.C.
For primary bibliographic entry see Field 2L.
W76-00533

HYDROLOGY AND WATER RESOURCES, A SYLLABUS OF REFERENCES FOR TEACHING INTRODUCTORY COURSES IN THE WATER ENVIRONMENT.
National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 10C.
W76-00536

FOCUS-COMPREHENSIVE W
RESOURCES MANAGEMENT,
URS Corp., New York
For primary bibliographic entry see Field 5C
W76-00623

TROUBLE IN PARADISE,
Clark Univ., Worcester, Mass. Dept. of E
mental Affairs
For primary bibliographic entry see Field 5C
W76-00625

A FOURTH DIMENSION--RECREATION AMENITY,
J. Humphries
Clean Air, Vol 5, No 18, p 7-12, Summer, 19

Descriptors: *Recreation demand, management(Applied), Water resources, L tion, Sewage treatment, Water utilization, users, Water pollution control, Water de Water districts, Regional development.
Identifiers: Regional Water Authorities Britain).

A discussion is presented on the use of resources in Great Britain specifically for r tional purposes and the management of waters for this purpose. While the Governm three priorities in the reorganization of wat vices have been securing an adequate clean supply for the needs of people and industry, sion of enough sewerage and sewage di facilities, and cleaning up of most of the riv the 1980's, a fourth aim has been added to t tional water strategy. This is that water sho viewed as an environmental amenity, for bot servation and recreation. The number of p participating in water-based leisure activiti been increasing in England and Wales and been proposed as governmental policy tha amenity use of water space should be pro and promoted at both a regional and a na level. Regional Water Authorities have taken the functions of River Authorities, responsib land drainage, pollution control water reso fisheries, and water recreation; Local Autho responsible for public water supply; and Se and Sewerage Authorities. The ten regional Authorities are defined in terms of areas and lations; their functions in terms of fish recreation, and amenities are also det (Kramer-FIRL)
W76-00644

A LAND USE DECISION METHODOLOGY ENVIRONMENTAL CONTROL,
Rocky Mountain Center on Environment, De Colo.
K. Wickersham, R. P. Hansen, and A. G. Mel
Available from the National Technical Info tion Service, Springfield, Va 22161, as PB-244 $7.00 in paper copy, $2.25 in microfiche. Env mental Protection Agency, Report EPA-600/ 008, March 1975. 180 p, 7 tab, 162 ref, 4 ap 1HA098. R802423.

Descriptors: *Land use, Environment, Eco Legislation, Water Resources, Planning, An cal techniques, Zoning, Ecosystems, Dec making, Environmental control, Planning, S aspects.
Identifiers: Land Use Controls, Model Land Legislation.

An ecologically responsible land use deci making system is proposed for local, regional to an extent, state governments. Referred t LUDMS, it is based on conclusions that governments have not dealt effectively with use problems because traditional planning land use control devices are unecological, responsive and unsystematic. The fundame premise of LUDMS is that environmen responsible land use planning and control mus

d on valid ecological information combined
enlightened and informed public opinion.
)MS makes use of several basic concepts, in-
ng policy planning (a process for combining
ic opinion with scientific and technical infor-
on to create community policies); use of an in-
sciplinary team; public participation; an en-
mental resources inventory and analysis; a
which understands and can communicate
t ecology; legal devices for land use control;
positive community programs. 'Model' state
ocal codes for implementing LUDMS are pro-
l. (EPA)
-00683

**ZONA STATE WATER PLAN, PHASE I: IN-
TORY OF RESOURCE AND USES,**
ona Water Commission, Phoenix.
erke, J. Linkswiler, E. Nemecek, F.
baugh, and M. Wurbs.
1975. 232 p, 48 fig, 31 tab, 137 ref, 5 append.

riptors: *Arizona, *Water resources, *Water
ation, *Water supply, *Water requirements,
er demand, Water law, Water conservation,
ndwater resources, Hydrology, Surface
rs, Water management(Applied), Water pol-
Water resources development, Planning, State
rnments, Overdraft, Potential water supply,
omics, Human population, Streams, Rivers,
ographies, Groundwater.
ifiers: *Water problems, Arizona State Water

Arizona Water Commission is developing a
Water Plan in the following three phases: (1)
ventory of the resource, current uses and as-
ted problems; (2) an identification and
iption of alternative futures available to the
; and (3) an evaluation of potential water
rce management plans. The series of studies
provide the physical and economic informa-
equired for the people of the state, local plan-
and legislators to make rational decisions
erning management of Arizona's water. This
tion is the first phase of the plan which
nts a status report on the state's water
rces, a look at the present situation, and an
ation of today's water problems. Information
en on existing water uses and supplies, popu-
, economy, water law, and major water
ems and needs. Also included in the study are
natic diagrams of rivers and streams in
na, crop distributions, theoretical depletions,
ecords of U.S. Geological Survey stream gag-
ations in Arizona. The report provides a sin-
ource of available information for the non-
ical user, a display of regionalizations and
arizations for the broad scope planner, and a
graphy of data available for detailed in-
gation. (Robinett-Arizona)
00700

**CUTIVE SUMMARY OF CRITICAL
ER PROBLEMS FACING THE ELEVEN
TERN STATES.**
u of Reclamation, Washington, D.C.
1975. 85 p, 36 fig, 2 tab.

riptors: *Comprehensive planning,
ning, *Forecasting, *Coordination, *Water
nd, *Water utilization, Southwest U. S.,
c Northwest U. S., *Water policy, *Water al-
on(Policy), Management, Long-term
ing, Future planning(Projected).
fiers: *Western U. S.

Executive Summary is supported by a com-
nsive report which presents in detail the
s of the Westwide Study. Generally the sum-
follows the outline and content of the report
resents in concise terms the highlights and
icant conclusions and recommendations of
port. The major contribution that these two
s can make is to define and influence the
and character of future Federal and State water resources investigations of the West through the year 1985. The present and near future critical water resources problems and issues of the West are clearly outlined. (See also W76-00717) (OWRT)
W76-00716

WESTWIDE STUDY REPORT ON CRITICAL WATER PROBLEMS FACING THE ELEVEN WESTERN STATES.
Bureau of Reclamation, Washington, D.C.
April 1975. 457 p, 67 fig, 153 tab.

Descriptors: *Comprehensive planning, *Planning, *Forecasting, *Coordination, *Water demand, *Water utilization, Southwest U. S., Pacific Northwest U. S., *Water policy, *Water allocation(Policy), Management, Long-term planning, Future planning(Projected).
Identifiers: *Western U. S.

The goal of this study effort, as outlined in Chapter I, Study Purpose, History and Approach, has been the development of adequate information upon which to base future significant decisions relative to the water and related resources of the 11 Western States. Chapter II, The Westwide Situation, provides an assessment of the present setting on water and land resources, population, economy, environment, minerals and energy. Chapter III, Aspects of the Future, examines various important factors which will influence water planning in the Westwide area with emphasis on year 2000. Chapter IV, Westwide Problems, discusses critical problems that are common to most of the 11 Western States. Chapter V, Regional Problems, presents critical problems that affect large geographic areas involving two or more States. Chapter VI, State Specific Problems, sets forth critical problems, more closely identified with individual State conditions. In the latter three chapters, various approaches to problem resolution are discussed, conclusions drawn, and recommendations made for supplemental or new studies were considered appropriate. Chapter VII, General Observations, synthesizes and consolidates the multitude of conclusions and recommendations. (See also W76-00716) (OWRT)
W76-00717

PROCEEDINGS, CONFERENCE ON WATER REQUIREMENTS FOR LOWER COLORADO RIVER BASIN ENERGY NEEDS.
Arizona State Fuel and Energy Office (Phoenix).
For primary bibliographic entry see Field 6D.
W76-00745

GROUNDWATER SEMINAR, GRANADA.
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 4B.
W76-00807

GROUNDWATER RESOURCES: EVALUATION AND EXPLOITATION,
Arizona Univ., Tucson. Dept. of Geoscience.
For primary bibliographic entry see Field 4B.
W76-00812

WATER RESOURCES OF WASHINGTON, A BIENNIAL REPORT TO THE LEGISLATURE, JANUARY 1975.
Washington State Dept. of Ecology, Olympia.
Biennial report, January 1975. 33 p, 5 fig, 3 tab.

Descriptors: *Water resources, *Washington, *Water supply, *Water rights, *Comprehensive planning, Planning, Management, State governments, Financing, Legislation, Lgal aspects, Water law, Water resources development, Surface waters, Groundwater, Irrigation, Industries, Hydroelectric power, Municipal water, Domestic water, Water utilization, Water shortage, River basins.

The Water Resources Act of 1971 directed Washington's Department of Ecology to develop a comprehensive state water resources program. For planning and management purposes, the state has been divded into 23 river basins plus the main stem of the Columbia River. Separate policy is being developed for each basin, and statewide policies are being created to deal with critical problems requiring consistent management. A water Resources Information System was established to serve as an archive of state water resources data. Surface water, groundwater, and saline water supply available in Washington was presented here, and existing use of water for domestic, municipal, and industrial supply was described. Irrigation accounts for 65% of total withdrawals from surface and groundwater sources, and current projections indicate irrigated acreage in the state will increase 50% by the year 2000. It was concluded that the existing water supply in Washington is inadequate or only marginally adequate to provide both instream needs and diversion requirements. The multitude of laws and treaties governing water rights in the state were explored, and several recommendations for changes in the state water code were made. Financial aspects of water resources development were discussed. A color map of federal and non-federal development projects was included. (Robinson - ISWS)
W76-00880+

STATE OF OHIO EX REL. BROWN V. CALLAWAY (ACTION BY STATE TO ENJOIN CONSTRUCTION OF TWO RESEARVOIRS).
For primary bibliographic entry see Field 6E.
W76-00951

TOWN OF ISLIP V. POWELL (ACTION TO ENJOIN RENTING DOCK FACILITIES).
For primary bibliographic entry see Field 6E.
W76-00955

CITIZEN SUITS SPUR COURT PROBES OF ENVIRONMENTAL IMPACT.
For primary bibliographic entry see Field 6E.
W76-00956

ARTIFICIAL ISLANDS: POSSIBILITIES AND LEGAL PROBLEMS,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6E.
W76-00965

RIVER DEFENSE COMMITTEE V. THIERMAN (ACTION UNDER NEPA TO COMPEL A PUBLIC HEARING BEFORE ISSUING PERMIT).
For primary bibliographic entry see Field 6E.
W76-00980

MARINE TOWING, INC. V. RED STAR TOWING AND TRANSPORTATION CO. (ACTION FOR DAMAGES SUFFERED WHEN TUG STRUCK A WRECK IN NAVIGABLE WATERS).
For primary bibliographic entry see Field 6E.
W76-00983

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

HOW TO ANALYZE INFILTRATION/INFLOW,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-00566

LIBRARY U. OF I. URBANA-CHAMPAIGN

ESTIMATING INDIRECT COST OF URBAN WATER USE,
Koebig and Koebig, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3D.
W76-00630

HIGHER PROFITS VIA ADVANCED INSTRUMENTATION,
Liptak Associates, Stamford, Conn.
For primary bibliographic entry see Field 5D.
W76-00635

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTE WATER TREATMENT IN CHLOR-ALKALI PRODUCTION,
Houston Univ., Tex. Dept. of Quantitative Management Science.
For primary bibliographic entry see Field 5D.
W76-00707

ELECTRONIC COMPUTATION OF QUANTITIES AND COSTS FOR SEWERAGE SYSTEMS CONSTRUCTION (MASSENERMITTLUNG UND KOSTENBERECHNUNG IM KANALISATIONSBAU MIT ELEKTRONISCHEN DATENVERARBEITUNGSANLAGEN),
For primary bibliographic entry see Field 5D.
W76-00796

COMPUTATION OF ECONOMIC DATA CONCERNING THE EXPLOITATION OF GROUNDWATER ON A REGIONAL SCALE,
Northern Sahara Water Resources Study Project, Alger (Algeria).
For primary bibliographic entry see Field 4B.
W76-00819

DISAPPROVAL OF THE DEFERRAL OF WATER POLLUTION CONSTRUCTION GRANT FUNDS.
Hearing--Subcommittee on Environmental Pollution, Committee on Public Works, U.S. Senate, 94th Congress, 1st Session, February 28, 1975. 101 p, 4 fig, 5 tab.

Descriptors: *Project planning, *Sewage treatment, *Treatment facilities, *Grants, Decision making, Administrative decisions, Employment, Construction, Planning, Legislation, Federal project policy, Federal government, United States, Water pollution, Public utilities, Judicial decisions, Federal Water Pollution Control Act.
Identifiers: *Funding(Federal), Environmental Protection Agency(EPA), *Federal Water Pollution Control Act Amendments.

In 1972 Congress authorized $18 billion for sewage treatment plants and related facilities. Half of this money, $9 billion, was Presidentially impounded before being ordered released by the Supreme Court. This Senate hearing was scheduled to consider a resolution disapproving the deferral of water pollution construction grant funds. Several water pollution and sewage treatment experts testified that not only could the amount released be put to quick and effective use, but much greater amounts as well. Delays in funding the sewage treatment construction were named as the reason for state lack of faith in the program, and for much inefficiency in state planning of sewage treatment projects. The experts said that immediate release of the money would have many beneficial effects, including the completion of a backlog of projects which have had to be postponed, and a 'ripple' effect on unemployment in states where the construction industry has been faltering. Since some states have fully committed their 1974 funds and a major portion of their 1975 funds, full allocation of the $9 billion will allow them to continue making progress toward achieving the goals of the 1972 Amendments. (Parrish-Florida)
W76-00986

6D. Water Demand

ESTIMATING INDIRECT COST OF URBAN WATER USE,
Koebig and Koebig, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 3D.
W76-00630

A TOWNSHIP'S NEED OF FILTERED WATER,
Tata Iron and Steel Co., Ltd, Jamshedpur (India) Town Engineering Dept.
For primary bibliographic entry see Field 3D.
W76-00641

A FOURTH DIMENSION--RECREATION AND AMENITY,
For primary bibliographic entry see Field 6B.
W76-00644

ARIZONA STATE WATER PLAN, PHASE I: INVENTORY OF RESOURCE AND USES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W76-00700

PROCEEDINGS, CONFERENCE ON WATER REQUIREMENTS FOR LOWER COLORADO RIVER BASIN ENERGY NEEDS.
Arizona State Fuel and Energy Office (Phoenix).
Available from Office of Arid Lands Studies, Univ. of Arizona, Tucson, Arizona 85719, for $10.00. Held at University of Arizona, Tucson, May 8-9, 1975, 344 p.

Descriptors: *Energy, *Water requirements, *Colorado River Basin, *Water demand, Water supply, Water utilization, Water management(Applied), Water quality, Geothermal studies, *Industrial production, *Competing uses, Oil shales, Arizona, *Southwest U.S., Planning, Environmental effects.
Identifiers: Coal gasification, Solor energy, Lower Colorado River Basin.

The conference was designed to provide the latest technical data on the management of water and energy needed to produce new energy sources in the Lower Colorado River Basin and relate this to the cost of maintaining the present environment. Of particular interest at the Conference was the realization that it takes energy, as well as water, to extract energy. Therefore, the papers delivered assessing new energy technology--oil shale, coal gasification, geothermal, and solar--accounted for both requirements. (See W76-00746 thru W76-00761)
W76-00745

OVERVIEW OF WATER REQUIREMENTS FOR ELECTRIC POWER GENERATION, (FOR THE LOWER COLORADO RIVER BASIN),
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
G. C. Jacoby, Jr.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975

Descriptors: *Water requirements, *Water supply, *Water demand, *Water shortage, *Water management(Applied), *Electric power industry, Economics, Water allocation(Policy), Water resources development, Water utilization, Water resources, Groundwater resources, Arid lands, Imported water, Overdraft, Water conservation, Water sources, Water distribution(Applied), *Colorado River Basin, Colorado River, Electric power production, Planning, *Energy, Water consumption.

The Lower Colorado River Basin region is consuming water faster than the annual replenishment rate. Augmentation, which is frequently tioned as a solution, has the problems of ownership costs and negative physical e The electrical power generation indust planning to increase its production and wat and has plans to provide most of their requirements for the next decade which wi sequently take away from the overall supply other users. It is now time to shift to carefu mand management in regard to both wate electrical energy. This management cou achieved through revised pricing, revised st and re-evaluations of beneficial consumptiv (See also W76-00745) (Robinett-Arizona)
W76-00746

WATER USE AS A FACTOR IN MEE ELECTRIC POWER NEEDS,
Salt River Project, Phoenix, Ariz.
R. F. Durning.
In: Conference on Water Requirements for L Colorado River Basin Energy Needs, Ma 1975, p 48-65. 8 fig, 1 ref.

Descriptors: *Water utilization, *Water con tion, *Cooling water, *Water requirem *Electric power industry, Recirculated Water allocation(Policy), Water demand, shortage, Arid lands, Water supply, Econo Water sources, *Colorado River Basin, E power production, Water shortage, C towers, Heated water, Reasonable use, Co Heat transfer, Ventilation, Costs, Efficie Energy.
Identifiers: Air cooling, Wet-dry cooling.

Water use for cooling by electric power gene is investigated and methods for more efficie or for alternative cooling designs are desc There is a potential for lowering the water re ments of present energy production by the the wet-dry cooling tower or to reduce th nearly zero by employing a straight dry sy These schemes, however, invoke moderate t stantial economic penalties to the cost of pr ing electrical power and of further concern i these less efficient heat rejection methods re a poorer utilization of already depleting e supplies. Cooling designs described inclu once-through system to a natural water evaporative cooling towers, man made bodies, air cooling(dry system), and wet-dry ing. (See also W76-00745) (Robinett-Arizona)
W76-00747

WATER FOR ENERGY AS RELATED WATER RIGHTS IN THE COLORADO R BASIN,
Arizona Water Commission, Phoenix.
W. E. Steiner.
In: Conference on Water Requirements for L Colorado River Basin Energy Needs, May 1975, p 66-79.

Descriptors: *Water requirements, *Ele power industry, *Water utilization, *W supply, *Water rights, *Energy, Water al tion(Policy), Water demand, Water shor Reasonable use, Water management(App Electric power production, Economics, W resources development, Water resources, lands, Water sources, Water dist tion(Applied), *Colorado River Basin, Colo River, Planning, Competing uses, Water Colorado River Compact, Agriculture.

The most fundamental of the laws governing w use in the Basin (the Colorado River Com drafted over 50 years ago), is described and breakdown of legal water entitlements is g Energy development in both the upper and l Colorado River Basins may soon be in compet with agriculture for available water resource allocation decisions are made strictly on the b of economics, energy production will be winner and sufficient water supplies will be

by the energy industry to meet their needs
hout the Basin. The area has water
ces sufficient to support any desirable level
rgy resource development. (See also W76-
(Robinett-Arizona)
0748

R AND ENERGY REQUIREMENTS FOR L SHALE INDUSTRY,
ic Richfield Corp., Los Angeles, Calif.
othfeld.
nference on Water Requirements for Lower
do River Basin Energy Needs, May 8-9,
81-105. 5 fig, 4 tab, 4 ref.

ptors: *Water requirements, *Water supply,
ric power production, *Oil shales, Electric
industry, Water utilization, Reasonable
conomics, Water resources, Water sources,
ado River Basin, Colorado River, Planning,
ting uses, Oil, Oil industry, *Colorado, Pro-
s, *Energy.
iers: Piceance Basin(Colo), Grand Val-
lo).

ost active area of oil shale development has
e Piceance Basin in Colorado, in which the
Development Operation Plant, between
nd Grand Junction, is described in terms of
ning and refinery technique and water and
requirements. Present water use by the cur-
olony design is about 11,800 acre-feet per
6.5 cfs) and with a projected ten-fold in-
by the mid-1980's, water use would be
118,000 acre-feet 1 year (165 cfs). The
e flow of the Colorado River at Grand Val-
600 cu. ft./second and the requirements of
olony plant and associated developments
to less than 0.5% of the average flow of
er at the Colony pump station. The industry
directly or indirectly can supply the fuel
for the power generating stations plus
en times that quantity of fuel for other pur-
(See also W76-00745) (Robinett-Arizona)
0749

LIMINARY ANALYSIS OF THE ENERGY WATER REQUIREMENTS FOR LOPING GEOTHERMAL ENERGY IN NA,
a Univ., Tucson. Dept. of Geosciences.
orton, and T. M. Gerlach.
nference on Water Requirements for Lower
do River Basin Energy Needs, May 8-9,
106-121. 4 fig, 1 tab, 3 ref.

tors: *Electric power production, *Water
ments, *Geothermal studies, *Water
*Arizona, Thermal water, Electric power
y, Water utilization, Economics, Water
es, Water sources, *Colorado River Basin,
g, Competing uses, Geophysics, Water
e, Costs, Arid lands, Heated water, Effi-
, Desalination, Saline water, Potable
*Energy.
ers: *Geothermal energy, Geothermal
irs, Energy requirements.

are several regions in Arizona that have
gh potential for the discovery of conven-
eothermal reservoirs. Geothermal energy,
most other energy alternatives, does not
extensive mining, refinement, packaging,
rtation, or surface storage of fuel, and, as a
ience, land, energy, and people remain
e for other activities. Geothermal energy
power systems have 2 distinct advantages
urrent energy production: (1) Resource
ment and delivery to the plant site con-
small amounts of energy, and (2) the
y of the resource has a minor impact on
environment. Water is also a natural by-
of geothermal energy use. Desalination
coupled to the geothermal fields could
about 50% of the potable water for the re-
A 2000 megawatt geothermal energy development would require about 2% of the total water used in Arizona. (See also W76-00745) (Robinett-Arizona)
W76-00750

WATER AND ENERGY REQUIRED TO OPERATE COAL GASIFICATION FACILITIES AND WASTE WATER TREATMENT REQUIREMENTS,
El Paso Natural Gas Co., Tex.
P. Milios.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 122-132. 1 fig.

Descriptors: *Water requirements, *Water supply, *Coal mines, *Waste water treatment, *Natural gas, Coal mine wastes, Water pollution, Water demand, Economics, Water allocation(Policy), Water utilization, Water resources, Arid lands, Water conservation, Water sources, Colorado River, Planning, Efficiencies, Water reuse, Recirculated water, *New Mexico, *Energy, Water consumption(Except consumptive use).
Identifiers: Lurgi coal gasification, El Paso Natural gas, *San Juan River(NMex), Energy requirements.

A coal gasification plant using Lurgi coal gasification technology that the El Paso Natural Gas corporation is planning to build in the Four Corners Area of New Mexico is discussed. The first plant will require 10,357 acre-feet per year of water from the San Juan River (a tributary of the Colorado) and will produce 275 billion Btu of synthetic pipeline gas. A water requirement of one gallon for each 27 thousand Btu includes provisions for mining coal, excluding electric power for the mine, for electric power and steam generation to run the plant, for a potable water system for the plant, and for supplying hydrogen for the gasification reactions. A detailed description of water reuse in the coal gasification process is given. Of the total water entering the process plant, including water contained in the coal as moisture, 67% evaporates, 24% is consumed via chemical reaction, 2.5% leaves the ammonia by-product, and the remaining 6.5% leaves the plant in flue gases, ash, and cooling tower drifts. (See also W76-00745) (Robinett-Arizona)
W76-00751

WATER AND ENERGY REQUIREMENTS TO MINE, PROCESS, AND REPROCESS NUCLEAR FUELS,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
R. L. Seale.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 133-150. 7 fig, 2 tab, 5 ref.

Descriptors: *Water requirements, *Water utilization, *Nuclear powerplants, *Electric power production, Water resources, *Water demand, Economics, Costs, Efficiencies, Nuclear reactors, Electric power, Water cooling, *Energy, Cooling water, Cooling towers, Heated water, Water consumption.
Identifiers: Energy requirements.

About 8% of the present electrical generating capacity in this country is in the form of nuclear generating plants. The largest water utilization outside the power plant is in the enrichment operation. This is the water associated with the generation of the electrical energy for enrichment which is counted twice if the reactor supplies the enrichment electrical energy. Water needs are a strong function of the cooling option that is used in the power plant. Evaporative cooling in wet cooling towers or the use of ponds or rivers for cooling use more water than the wet-dry radiator type of cooling but at the same time the cost varies drastically from location to location. Water required by a single 1,000 megawatt power plant in million gallons per year is 123 for mining, 65 for milling, 26.3 for Uranium production, 11,900 for isotopic enrichment, 5.2 for fuel fabrication, 65,000 to 554,000 for the nuclear power reactor, 10 for fuel processing and 0.26 for waste management. (See also W76-00745) (Robinett-Arizona)
W76-00752

WATER AND ENERGY REQUIREMENTS IN THE MINING AND PROCESSING OF COAL, INCLUDING LAND RECLAMATION,
Peabody Coal Co., St. Louis, Mo.
E. D. Neihaus.
In: Conference on Water Requirements for Lower Colorado River Basin Energy Needs, May 8-9, 1975, p 151-164. 3 fig.

Descriptors: *Water requirements, *Water utilization, *Coal mines, *Water supply, *Arid lands, Strip mines, Coal mine wastes, Water demand, Economics, Costs, Water resources, Water sources, Planning, Efficiencies, Electric power production, *Arizona, Groundwater resources, Land reclamation, Revegetation, Aquifers, *Energy, Water consumption.
Identifiers: Energy requirements, Black Mesa(Ariz), Black Mesa mine, Peabody Coal Company.

The Peabody Coal Company's Black Mesa Mine on the Black Mesa in Northeastern Arizona is discussed. The mined land is graded and revegetated so that it is a good or better grazing land than it was before it was mined. Annual water consumption by the operation is 3,000 to 3,500 acre-feet and it is estimated that the Navajo sandstone, which furnished the water, contains an estimated 10 million acre-feet. In 1974, the mined used 75,000,000 gallons of water and the pipeline to the power plant in Nevada required 1,097,800,000 gallons (298 gallons/ton of coal). Estimations show that the operation will deliver about 100 Btu for every one consumed. (See also W76-00745) (Robinett-Arizona)
W76-00753

ENERGY QUALITY INTERACTIONS OF SUNLIGHT, WATER, FOSSIL FUEL, AND LAND,
Florida Univ., Gainesville, Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 3E.
W76-00754

ENVIRONMENTAL ASPECTS OF SOLAR ENERGY APPLICATIONS,
Arizona Univ., Tucson. Opitical Sciences Center.
For primary bibliographic entry see Field 3E.
W76-00755

ADVANCED PROCESSES: WATER DESALTING AND REUSE,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 5D.
W76-00756

POTENTIAL FOR AGRICULTURE UTILIZING WASTE HEAT FROM POWER PLANTS,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 3C.
W76-00757

WATER CONSUMPTION AND POWER PLANT HEAT REJECTION,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 3E.
W76-00758

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THERMAL POWER PLANT SITING IN AN ARID REGION-ENVIRONMENTAL CONSTRAINTS,
Bechtal Power Corp., Los Angeles, Calif.
For primary bibliographic entry see Field 3E.
W76-00759

CITY WASTE WATER REUSE FOR NUCLEAR POWER PLANT COOLING,
Arizona Public Service Corp., Phoenix.
For primary bibliographic entry see Field 5D.
W76-00760

ENVIRONMENTAL COSTS FOR THE NAVAJO GENERATING STATION,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 5D.
W76-00761

CUSTOMARY USE OF FLORIDA BEACHES,
For primary bibliographic entry see Field 6E.
W76-00929

THE POTOMAC, 1974 ANNUAL REPORT.
Interstate Commission on the Potomac River Basin, Bethesda, Md.
For primary bibliographic entry see Field 4D.
W76-00935

WATER AND RELATED LAND RESOURCES (AS AMENDED).
Minnesota Sess. Laws, Vol 4, Ch 558, S F No 734, p 1069-1073, approved--effective immediately (1974).

Descriptors: *Minnesota, *Legislation, *Water allocation(Policy), *Priorities, *Comprehensive planning, Future planning(Projected), Preferences(Water rights), Water management(Applied), Appropriation, Water utilization, Water law, Water rights, State governments, Legal aspects, Water conservation, Regulation, Administration, Water policy, Public rights, Water demand, Water resources development, Water resources, Water supply, Priorities, Prior appropriation.
Identifiers: Environmental policy, Administrative regulations, Public trust doctrine.

The Minnesota state commissioner of natural resources, in cooperation with other federal, state and local agencies, is directed to prepare a statewide water and related resources plan to be approved by the legislature. The Commissioner shall establish rules and regulations governing the granting of permits for appropriation and use of public waters, and for changing the course, current, or cross-section of public waters. These regulations shall be consistent with standards herein set forth and the following priorities for appropriation and use of water: domestic water supply; uses involving consumption of less than 10,000 gallons per day; power production, industrial and commercial uses; and other uses involving consumption in excess of 10,000 gallons per day. Appropriation or use of any waters of the state, surface or underground, without written permit of the commissioner is prohibited. This prohibition does not apply to domestic uses serving less than 25 persons. The Commissioner shall impose charges for the excavation of minerals from the beds of public waters. The Commissioner shall also assess the need for particular kinds of lake improvements and shall establish criteria for allocating state aid funds among proposed projects. (Deckert-Florida)
W76-00942

CITY OF DAYTONA BEACH V. TONA-RAMA, INC. (ACTION FOR INJUNCTION TO PREVENT ERECTION OF PUBLIC OBSERVATION TOWER ON BEACH).
For primary bibliographic entry see Field 4C.
W76-00978

6E. Water Law and Institutions

CITIZEN ENFORCERS: INFLUENCING WATER RESOURCES ALLOCATION DECISIONS,
Georgia Inst. of Tech., Atlanta. Inst. of Government.
For primary bibliographic entry see Field 5G.
W76-00505

BIBLIOGRAPHY OF HYDROLOGY, CANADA, 1971-1973.
International Association of Hydrological Sciences, Ottawa (Ontario).
For primary bibliographic entry see Field 10C.
W76-00532

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W76-00535

SALINITY POLICY FOR COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-00553

SALINITY CONTROL AND FEDERAL WATER QUALITY ACT,
Bureau of Reclamation, Denver, Colo. Water Quality Office.
For primary bibliographic entry see Field 5G.
W76-00617

THE FEDERAL CONSTRUCTION GRANT PROCESS FROM A (BILENE) TO Z (ANESVILLE),
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W76-00629

FINLAND'S CLEANUP CAMPAIGN,
For primary bibliographic entry see Field 5G.
W76-00631

A STRATEGY FOR WATER POLLUTION CONTROL IN BRITAIN,
For primary bibliographic entry see Field 5D.
W76-00638

A CONTINUOUS GARGANTUAN TASK FOR SEVERN TRENT,
Severn Trent Water Authority (England).
For primary bibliographic entry see Field 5A.
W76-00640

EXECUTIVE SUMMARY OF CRITICAL WATER PROBLEMS FACING THE ELEVEN WESTERN STATES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-00716

WESTWIDE STUDY REPORT ON CRITICAL WATER PROBLEMS FACING THE ELEVEN WESTERN STATES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-00717

WATER FOR ENERGY AS RELATED WATER RIGHTS IN THE COLORADO BASIN,
Arizona Water Commission, Phoenix
For primary bibliographic entry see Field 6D
W76-00748

DESIGN CRITERIA--WASTE TREATMENT PLANTS AND TREATMENT OF SEWER OVERFLOW,
Environmental Protection Agency, Springfie
For primary bibliographic entry see Field 5D
W76-00769

AID TO MUNICIPALITIES FOR WATER SUPPLY, POLLUTION ABATEMENT AND SEWER SEPARATIONS.
Vermont Public Acts No 97, 1971. 6 p.

Descriptors: *Legislation, *Water s
*Pollution abatement, *Separated sewers, S
districts, Cities, Cost sharing, *Vermont.

An act, providing for aid to municipaliti
water supply, pollution abatement, sewer s
tion, and engineer planning, first enumerat
procedure required to form a consolidated
district and provides that such a body sh
eligible to receive state aid. Requirements fo
ment and repayment, priorities and limitatio
peal of decisions, and administrative regul
are set forth. The act makes provisions f
method of obtaining grants, priorities to b
lowed, appeal, and administrative regulation
act provides for technical and other servi
municipalities and details the method of ap
tion, form of contacts to be used, eligibilit
limitation. (Sandoski-FIRL)
W76-00789

SPECIAL TIME SCHEDULE FOR THE AND COUNTY OF SAN FRANCISCO R TIVE TO REGULATION OF DISCHA FROM COMBINED SEWERS,
California Regional Water Quality Control B
Oakland. San Francisco Bay Region.
W. C. Weber.
Resolution No 70-93, amending Resolution N
74, California Regional Water Quality C
Board, San Francisco Bay Region, Novemb
1970. 2 p.

Descriptors: *Legislation, Facilities, Sewe
Wastes, Construction, Sewage, Storm w
Combined sewers, *California.
Identifiers: *San Francisco(Calif).

A resolution which contained a time schedu
the city and county of San Francisco to stud
develop a master plan for facilities needed to
late the quality of wastes discharged from its
bined sewerage system was amended for an e
sion of time for the completion of this study
gram. Under this sewerage master plan, a de
time schedule for construction of all fac
necessary for compliance with the Board of S
visor's requirements related to bypassing of
tures of sewage and storm water from city se
was prepared. (Sandoski-FIRL)
W76-00806

SOME FACTORS INFLUENCING GROU WATER DEVELOPMENT AND USE AGRICULTURE,
Food and Agricultural Organization, Rome (I
Land and Water Development Div.
For primary bibliographic entry see Field 4B.
W76-00813

WATER RESOURCES OF WASHINGTON BIENNIAL REPORT TO THE LEGISLATU JANUARY 1975.
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 6B.

-00880+

IAL, LEGAL, AND ECONOMIC CON-
ERATIONS OF ANIMAL PRODUCTION IN
ANIZED AREAS,
primary bibliographic entry see Field 5D.
-00916

LEAR SHIP POLLUTION: NATIONAL AND
ERNATIONAL REGULATION AND LIA-
TY,
Schuster, II.
ronmental Law, Vol 5, No 2, p 203-240, 1975.
ef.

riptors: *Radioactivity, *Nuclear wastes,
rnational commissions, *Accidents,
rnational waters, Navigable waters, United
s, Hazards, Adoption of practices, Water
tion, Nuclear reactors, International law,
es, Administration, Control, Pollution abate-
, Regulation, Environmental effects, Coor-
ion, Irradiation, Harbors, Public health,
arge(Water), Coolants.
ifiers: *Nuclear ships, *Absolute liability,
guous zone, Coastal waters, Reactor coo-
Safety of Life at Sea Convention (SOLAS),
e Dumping Convention, Marine Protection
Liability, Hazardous substances(Pollution),
ronmental Protection Agency.

dwide interest in nuclear ship propulsion has
n due to the rising cost of fuel oil. However,
ern over the safety hazards presented by
ar vessels has generated a number of interna-
agreements aimed at (1) preventing radioac-
ollution by ships, and (2) providing liability
uclear accidents. While the likelihood of spil-
rom an overheated reactor is deemed remote,
jor accident at sea would result in harmful
ion exposure for more than a fifty-mile
s. Discharge of reactant coolant water is also
tially harmrful if not strictly regulated. The
e Dumping Convention, Marine Protection
Safety of Life at Sea (SOLAS) Covention,
he Savannah Agreement deal with various
ts of controlling radioactive materials on the
eas. Yet, a major weakness exists becasue of
ck of an independent fact-finding system to
international compliance with safety stan-
The Convention on the Liability of Opera-
f Nuclear Ships departs from traditional ad-
y rules governing collision and liability, an-
ing seven basic principles regarding nuclear
ability. The extension of the Price-Anderson
ic Energy Damages Act to cover nuclear
is also explored. (Parrish-Florida)
0921

THER MODIFICATION LAW DEVELOP-
TS,
na Univ., Tucson.
rimary bibliographic entry see Field 2B.
0923

N OIL CO. V OPPEN: RECOVERY OF A
LY ECONOMIC LOSS IN NEGLIGENCE
E ON CASE ARISING FROM OIL SPILL).
Law Review, Vol 60, No 2, p 315-327, 1974.
f.

iptors: *Oil pollution, *California,
omic impact, *Negligence, Legal aspects,
ills, Costs, Social impact, Fish, Fishkill,
g, Water pollution effects, Pollutants, Water
on sources, Water quality, Oil industy, Judi-
ecisions, Penalties(Legal), Federal jurisdic-

iers: Coastal waters, Hazardous sub-
s(Pollution).

ecent case, Union Oil Company v. Oppen,
inth Circuit applied California tort law to
commercial fishermen to recoup business losses caused by a negligent oil spill. This decision runs contrary to the generally accepted principle that no recovery is available for economic losses suffered as a result of a defendent's negligence. In arriving at its holding the Ninth Circuit made two essential determinations: (1) The oil company owed a duty to the commercial fishermen to conduct its drilling operations in a reasonable prudent manner to avoid the negligent diminution of the aquatic life; and (2) Any such diminution and damage to fishing could have been anticipated. The court cited the policy considerations against pollution, the need for deterring oil spills, and the economic theory of the optimum apportionment of losses to support its decision. Environmentalists will benefit from the decision because a more pervasive duty of care will be imposed on oil companies engaging in offshore drilling. (Nursey-Florida)
W76-00924

MINERAL DEVELOPMENT AND THE ENVIRONMENT: LEGAL REFORMS FOR THE SITING OF MAJOR FACILITIES,
R. P. Hansen.
Rocky Mountain Mineral Law Institute Annual, Vol 20, p 565-599, 1975. 70 ref, append.

Descriptors: *Federal government, *State governments, *Sites, *Industrial plants, *Legal aspects, Clean Air Act, Planning, Mining, Mining engineering, Colorado, Regional development, Regulation, Environmental control, Environmental engineering, Environmental effects.
Identifiers: Environmental monitoring, Legislation(Proposed), Private sector planning, Environmental impact statements, National Environmental Protection Act.

The conflicts between environmental values and economic developments usually focus on the siting of industrial facilities. Four arguments precede a discussion of governmental and private siting efforts. First, environmental impact statements have little impact upon actual decision-making. Second, the private sector is more likely to produce innovative planning techniques. Third, environmental analysis will become a regular part of mining operations. Finally, initial federal procedures on environmental planning will be augmented by procedures from the private sector and other levels of government. Existing federal legislation encourages environmental planning in addition to requiring disclosure of adverse environmental effects. The Clean Air Act authorizes the states to regulate air pollution from any major industrial facility, including mineral facilities. The main problem with current federal legislation is that each act is only a piecemeal solution of pollution problems. Recent federal legislation is aimed at providing comprehensive land use regulation which also permits states to devise their own methods of planning. Some state legislation regulates industrial-site planning. Progress is being made by several mining companies towards involving the public in planning new sites. Several new organizational tools are needed to integrate planning efforts, such as an environmental data bank and monitoring system. (Jenkins-Florida)
W76-00925

THE BOUNDARY WATERS TREATY OF 1909: DOES IT PROVIDE AN ENVIRONMENTAL CAUSE OF ACTION,
A. T. Carter.
South Dakota Law Review, Vol 20, No 1, p 147-180 (1975). 34 p, 174 ref.

Descriptors: *Treaties, *International law, *Canada, *United States, *Legal agents, Penalties(Legal), Constitutional law, Jurisdiction, Federal jurisdiction, Water law, Governmental interrelations, Internation waters, Foreign waters, Foreign countries, Water pollution, Water quality, Water pollution control, Water pollution sources, Path of pollutants, Water pollution effects.
Identifiers: *Garrison Division Project, *Boundary Waters Treaty of 1909, *Standing(Legal).

The Garrison Division Project is used as a frame of reference to examine, whether the Boundary Waters Treaty of 1909 provides a cause of action Which may be asserted by Canadian citizens in United States courts against the Federal Government for polluting waters crossing the boundary. Treaties are the supreme law of the land pursuant to Article VI of the Constitution and as such, are binding upon the States. Responsibility for giving effect to a treaty rests in part on the judiciary. Whether a particular treaty is entitled to judicial enforcement depends on whether a claim for relief arising under the treaty gives rise to a justiciable controversy. In the case of the Boundary Waters Treaty, justiciability depends on the following factors being shown: (1) the treaty is self-executing; (2) the legislation authorizing the Garrison Division Project does not abrogate the treaty; (3) the treaty grants private rights and remedies; (4) relief is not precluded by failure to exhaust provisions of the treaty; (5) consideration of the treaty is not barred by the political questions doctrine. All five factors are examined and it is concluded that the treaty does provide a cause of action for Canadian citizens in American courts. (Nursey-Florida)
W76-00926

LAKE STREAM CONTRVERSY: A FINAL DECISION,
N. J. Schexnayder.
Loyola Law Review, Vol 21, No 1, p 264-270, 1975. 56 ref.

Descriptors: *Louisana, *Accretion, *Boundaries(Property), Boundary disputes, High water mark, Low water mark, Legal aspects, Water law, Shores, Civil law, Judicial decisions, Legislation, Natural resources, Water rights, Bodies of water, Rivers, Lakes, Streams, Inland waterways.
Identifiers: *Articles 509 and 510 of the Louisiana Civil Code.

The Louisiana law concerning ownership of accretion is dicussed. In interpreting Articles 509 and 510 of the Louisiana Civil Code, the Supreme Court of Louisiana has held the only acknowledged right to the ownership of accretion is that of the accretion formed on rivers and running streams. The legal boundaries of lakes or ponds remain unchanged even though thin physical boundaries may change due to natural processes. The major controversy concerning ownership of land formed by accretion arises in determining whether a body of water is a river or running stream. In the past, the Louisiana courts have held that the ability of a body of water to form accretion is the primary factor to be considered in classifying it. A recent Louisiana Supreme Court case which employs a new test to determine the legal classification of a body of water is discussed. The court turned to a multiple factor test for the classification of a body of water, considering the size, depth, bank, channel and current of the particular body of water, especially as compared to that of streams that enter it. The court also gives heavy consideration to the historical designation of the body of water.(Nursey-Florida)
W76-00927

ENVIRONMENTAL LAW: WEATHER MODIFICATION-PROPOSED FEDERAL LEGISLATION AND THE OKLAHOMA WEATHER MODIFICATION ACT,
R. J. Gore.
Oklahoma Law Review, Vol 28, No 1, p 144-151, 1975. 64 ref.

Descriptors: *Weather modification, *Environmental effects, *Legislation, *Penalties(Legal), *Regulation, Oklahoma, En-

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vironmental control, Permits, Droughts, Legal aspects, Research and development, Agroclimatology, Climatology, Cloud physics, Flood control, Meteorology, Weather, Weather data, Control.
Identifiers: Licenses, National Environmental Policy Act, State policy, Administrative regulations.

The issue of state versus federal control of weather modification is discussed. An Oklahoma senator has proposed federal legislation to provide matching funds for the Oklahoma Weather Modification Act and similar state programs. Weather modification techniques have aroused opposition by environmentalists. The Oklahoma Act provides that persons engaging in weather modification activity without a license or permit shall be subject to a misdemeanor citation and a fine. Authority for local governments to raise revenue for weather control projects is included in the Act. The federal bill would authorize the Environmental Protection Agency (EPA) administrator to carry out an emergency drought assistance and prevention program where livestock or crops are threatened. Matching fund grants to encourage states to develop weather control programs would be available. A second bill would establish a National Weather Modification Commission under the EPA. Coordinated research and development combined with the environmental safeguards of National Environmental Policy Act indicate that federal assistance in state weather control projects is desirable. (Jenkins-Florida)
W76-00928

CUSTOMARY USE OF FLORIDA BEACHES,
P. Ireland.
University of Miami Law Review, Vol 29, No 1, p 149-153, 1974. 5 p, 27 ref.

Descriptors: *Florida, *Judicial decisions, *Public rights, *Prescriptive rights, *Local governments, Beaches, Legal aspects, Zoning, State governments, Recreation facilities, Public benefits, Public lands, Land tenure, Recreation.
Identifiers: Declaratory judgement, Custom(Doctrine), Injunctive relief, Property law.

Plaintiff, owner of an observation tower, sought a declaratory judgement against defendant, municipality and construction company, which had been issued a permit to build a tower. Ownership of the land underneath the proposed building was in controversy. Plaintiff claimed that the public had acquired a prescriptive right to use the land. Florida courts have required clear proof of adversity to establish a public right by prescription. A presumption that public use is permissive must be overcome to prove adverse use. In the instant case, the Supreme Court ruled that plaintiff had not established a public easement by prescription because defendant owned an adjacent pier and therefore sought the presence of the public. Summary judgement in favor of plaintiff was vacated and the case remanded to determine whether a public right was established by custom. Where public use of a private beach is reasonable and has continued for many years without dispute or interruption, a public right evolves from custom. A land owner may not then use the land in a manner inconsistent with the public right. The decision represented the first time that the Florida Supreme Court utilized the doctrine of custom to establish public rights in private property. (Jenkins-Florida)
W76-00929

NO DUMPING IN THIS OCEAN: NEARING THE END OF SHIP-GENERATED POLLUTION,
For primary bibliographic entry see Field 5B.
W76-00930

PROPERTY--CLASSIFYING BODIES OF WATER AS LAKES OR STREAMS,
For primary bibliographic entry see Field 2E.
W76-00931

THE THIRD UNITED NATIONS CONFERENCE OF THE LAW OF THE SEA: THE 1974 CARACAS SESSION,
J. R. Stevenson, and B. H. Oxman.
American Journal of International Law, Vol 69, No 1, p 1-30, 1975. 60 ref.

Descriptors: *United Nations, *Treaties, *Law of the sea, *International law, Negotiations, Legal aspects, Water rights, Governments, International waters, Water law, Governmental interrelations, Navigation, Fishing, Resources, Organizations, Foreign countries, Foreign waters, Oceans.
Identifiers: *The Third United Nations Conference on the Law of the Sea, Coastal waters, Contiguous zone.

The accomplishments and failures of the 1974 Session of the Third United Nations Conference on the Law of the Sea are described. The object of the Law of the Sea Conference is a comprehensive Law of the Sea Treaty. While this was not achieved, the 1974 Session accomplished a great deal and the foundation has been laid for a workable treaty. The most important accomplishments of the session are as follows: (1) an agreement was reached on the Rules of Procedure and the Conference adopted a 1975 work schedule deliberately devised to stimulate agreement; (2) the inclusion in the treaty of a 12-mile territorial sea and a 200-mile economic zone was all but formally agreed upon; (3) the first steps have been taken toward real negotiation of the basic questions of the system and conditions of exploitation of deep seabeds; (4) traditional regional and political alignments of states are being replaced by informed groups whose membership is based on similarities of interest on a particular issue. Considerable progress has been made in all important areas and if the states now negotiate on the hard issues, there can be a widely acceptable Law of the Sea Treaty in 1975. (Nursey-Florida)
W76-00932

SYSTEM FOR EXPLOITATION OF THE 'COMMON HERITAGE OF MANKIND' AT THE CARACAS CONFERENCE,
Ministry of Foreign Affairs, Nairobi (Kenya). Legal Div.
For primary bibliographic entry see Field 6A.
W76-00933

TERRITORIAL SOVEREIGNTY AND THE PROBLEM OF TRANSNATIONAL POLLUTION,
G. Handl.
American Journal of International Law, Vol 69, No 1, p 50-76, 1975. 162 ref.

Descriptors: *International law, *Water pollution effects, *Legal aspects, *Penalties(Legal), *Australia, Pollutants, Water pollution sources, Path of pollutants, Pollutant identification, Water pollution control, Radioactivity, Radioactivity, effects, Nuclear explosions, Governmental interrelations, Foreign countries, Governments, Foreign waters, International waters.
Identifiers: *Territorial sovereignty, International Court of Justice(ICJ), Standing(Legal).

In a case concerning the legality of French atmospheric nuclear testing in the South Pacific currently before the International Court of Justice (ICJ), Australia has raised the issue that the deposits of radioactive fallout on the territory of Australia without Australia's consent violates Australian sovereignty over its territory. In the context of the aforementioned case, the legal rules applicable to situations involving activities which although lawful nonetheless produce environmental effects in territory of another state are discussed. After an examination of the pertinent case law and writings in the area, the following conclusions are made: (1) International law requires proof of material damage as a condition precedent to establishment of legal responsiblity on the part of the polluting state therefore state affected by transnational pollution c prevail with a claim based merely on a violati its sovereignty. (2) Material damage mu established as the direct consequence of an a transfrontier crossing of pollutants before a of action by the affected state against the pol state would arise. (Nursey-Florida)
W76-00934

THE POTOMAC, 1974 ANNUAL REPORT.
Interstate Commission on the Potomac Basin, Bethesda, Md.
For primary bibliographic entry see Field 4D.
W76-00935

DEPARTMENT OF NATURAL RESOURC MAYOR AND COUNCIL OF OCEAN (ACTION BY OWNER OF LAND TO REA OCEAN FRONT TRACT TO ENJOIN STRUCTION OF CONDOMINIUM).
For primary bibliographic entry see Field 6G.
W76-00936

AMENDING THE WILD AND SCENIC RI ACT OF 1968 BY DESIGNATING A SEGM OF THE NEW RIVER AS A POTENTIAL PONENT OF THE NATIONAL WILD SCENIC RIVERS SYSTEM.
For primary bibliographic entry see Field 6G.
W76-00937

UNITED STATES V GAF CORPORA (ACTION FOR INJUNCTIVE RELIEF DISPOSAL OF ORGANIC WASTES BY WELL INJECTION).
For primary bibliographic entry see Field 5B.
W76-00938

SAVE OUR SOUND FISHERIES V CALLA (ACTION TO ENJOIN DUMPING DRE SPOIL INTO NAVIGABLE OCEAN WATE
For primary bibliographic entry see Field 5C.
W76-00939

WATER AND RELATED LAND RESOU (AS AMENDED).
For primary bibliographic entry see Field 6D.
W76-00942

PERMITS FOR ACTIVITIES IN NAVIG WATERS OR OCEAN WATERS.
For primary bibliographic entry see Field 8A.
W76-00945

CARCINOGENS COMPLICATE CHLO QUESTION,
For primary bibliographic entry see Field 5B.
W76-00946

CHEMEHUEVI TRIBE OF INDIANS FEDERAL POWER COMMISION (ACTIO DETERMINE JURISDICTION OF FPC THERMAL ELECTRIC POWER PL LOCATED ON NAVIGABLE STREAMS).
95 S Ct 1066-1082 (1975), 17p.

Descriptors: *Jurdicial decisions, *Th powerplants, *Hydroelectric power, *Fe Power Act, *Jurisdiction, Colorado River, Na ble waters, Permits, Indian reservations, Fe government, Federal jurisdiction, Thermal p Thermal water, Navigable rivers, Electric p Electric power industry, Electric power plant
Identifiers: Licenses, Dam effects, Indian t Indian water rights.

Plaintiffs, Indian tribes and environmental gr requested defendant, Federal Power Comm

o require defendant public utility compa-
btain licenses for thermal-electric generat-
ts under construction along the Colorado
he complaint was dismissed by the FPC on
nds that thermal-electric plants are not
works' under Section 4e of the Federal
ower Act of 1920. The Court of Appeals
District of Columbia affirmed the agency's
dismiss for lack of jurisdiction. Plaintiffs
that a literal reading of the statute showed
rmal-electric power plants drawing water
vigable streams are under FPC jurisdic-
e Supreme Court approved the Circuit
olding that the scope of the Act does not
o steam power. The FPC has consistently
ed that its licensing authority extends
hydroelectric projects. The Court dis-
ith lower court's opinion that the 'surplus
lause of Section 4e afforded the FPC a
uthority over federally controlled waters.
C has never licensed thermal-electric
lants using surplus water from Govern-
ns. (Jenkins-Florida)
47

WHITE FUEL CORP. (APPEAL FROM
TION OF VIOLATION OF REFUSE

ary bibliographic entry see Field 5B.
48

OF STATE OF NEW YORK V.
LER (APPEAL FROM CONVICTION
OLATION OF ORDINANCE REGULAT-
TER SKIING WITHIN A HARBOR).
S.2d 939 (S Ct 1974).

ors: *Water skiing, *Recreation,
tion, *Surface waters, *Harbors, Recrea-
ties.
s: *Municipal ordinance, *Police power,

ts were convicted of violating a mu-
rdinance regulating water skiing within
s harbor. On appeal, the defendants con-
at the jurisdiction conferred on the Com-
of Conservation by state law preempted
regulation. The New York Supreme
d that in absence of specific state legisla-
rning the conduct of water-skiing on tide
ying within county boundaries, local
nts may properly enact ordinances to
his activity. (Denvir-Florida)
9

HEMICAL INDUSTRIES, INC. V. AN-
(ACTION FOR DAMAGES FROM
GE OF POLLUTANTS INTO CREEK
G PLAINTIFF'S LANDS).
d 309 (Texas App. 1970).

rs: *Land tenure, *Industrial wastes,
*Carbon, *Chemical industry, Judicial
Water law, Legal review, Streams,
ater pollution, Waste water disposal,
Water quality, Federal jurisdiction, En-
al effects, Water pollution sources.
: *Fair market value, *Punitive

rought by a landowner against a carbon
plant which discharged industrial waste
k which crossed the plaintiff's land. The
urt held for the landowner. The Texas
Civil Appeals for the sixth circuit af-
ding that in cases of intentional continu-
on each day's pollution is a new offense.
hat the defendant had been granted a
discharge pollutants into a stream was
nse to an action for pollution damages.
ct measure of damages where the
n of fair market value is less than the
toration is the diminution of fair market
court also held that by intentional viola-

tion of its permit the defendent was responsible for malicious and wanton disregard of rights and safety of others justifying an award of punitive damages. (Sperling-Florida)
W76-00950

STATE OF OHIO EX REL. BROWN V. CALLAWAY (ACTION BY STATE TO ENJOIN CONSTRUCTION OF TWO RESEARVOIRS).
497 F.2d 1235 (6th Cir June 6, 1974).

Descriptors: *Ohio, *Federal Water Pollution Control Act, *Construction, *Legal aspects, *Judicial decisions, Reservoirs, Legislation, Recreation, State governments, Social aspects, Aesthetics, Water law.
Identifiers: *Economic aspects, *Injunctive relief, *Standing, *Environmental impact statement.

An action was brought by the State of Ohio seeking to enjoin the Army Corps of Engineers from constructing two reservoirs. The district court entered an injunction, permitting limited construction despite the fact that the Army Corps of Engineers had failed to file an adequate environmental impact statement. The court also refused to allow certain conservation groups, property owners, and a contractors' association to intervene in the action. The Court of Appeals held the determination that the Army Corps of Engineers had failed to file an adequate environmental impact statement did not require an injunction against all activities. The district court may tailor the relief granted to the particular circumstances of the case. The appellate court also held that the applicants for intervention had an unconditional right to intervene under the Federal Water Pollution Control Act. (Sperling-Florida)
W76-00951

STATE OF WISCONSIN V. MICHELS PIPELINE CONSTRUCTION, INC. (ACTION FOR AN ORDER TO CONSTRUCT SEWER SO AS NOT TO CREATE A NUISANCE TO NEIGHBORING LANDOWNERS).
For primary bibliographic entry see Field 5D.
W76-00952

TEMPLETON V. HUSS (ACTION FOR INJUNCTIVE RELIEF FOR INCREASED SURFACE WATER RUNOFF).
For primary bibliographic entry see Field 4B.
W76-00953

CITY OF WAUKENGAN V. POLLUTION CONTROL BOARD (APPEAL FROM PROCEEDING ASSESSING FINES AGAINST CITIES AND CORPORATION).
For primary bibliographic entry see Field 5B.
W76-00954

TOWN OF ISLIP V. POWELL (ACTION TO ENJOIN RENTING DOCK FACILITIES).
358 N.Y.2d 985 (Sup Ct Suffolk County 1974).

Descriptors: *New York, *Riparian rights, *Zoning, *Marinas, *Docks, Judicial decisions, Legal aspects, Planning, Local governments, Coastal structures, Navigable waters, Riparian land, Land use, Beds, Construction.
Identifiers: *Ordinances, *Submerged lands.

Plaintiff brought suit to enjoin marina operators from renting docking facilities on a portion of their marina, which extended from their adjacent residentially-zoned property. The court held that tidewaters are exempt from the State's jurisdiction over navigation, entitling the town to enforce its ordinance through injunctive relief. The court found that use of commercial docks in front of residentially-zoned property could not be seen as an extension of raparian rights, and not deserving of exemption from zoning restrictions. The town ordinance provided that underwater land shall be considered within the same zoning district as the abutting land for a distance of one hundred feet. Riparian owners have the right of access to navigable waters including the right to construct a dock. Those rights, however, are an extension of the rights of abutting land ownership and subject to the same limitations. (Sperling-Florida)
W76-00955

CITIZEN SUITS SPUR COURT PROBES OF ENVIRONMENTAL IMPACT.
Electrical World, Vol 177, p 28, May 1, 1972.

Descriptors: *Legal aspects, *Environmental effects, *Decision making, *Federal government, Administrative agencies, Adoption of practices, Project planning, Legislation, Judicial decisions, Legal review, Regulation, Administration, Law enforcement, Governments, Governmental interrelations.
Identifiers: *National Environmental Policy Act, Environmental impact statement, Private interests groups, Private enforcement.

The National Environmental Policy Act of 1969 requirement of environmental impact statement is court enforceable at the suit of interested citizens. The general counsel to the Council on Environmental Quality believes that citizen suits will lead to a rigorous probing of the environmental impact of government action. The Council views environmental laws as carrying with them a broad concept of standing to sue. In practice federal agencies submit statements on any project having some effect on the environment. Some officials have termed the process a procedural nightmare requiring vast amounts of paper and analysis. Another difficulty for agencies is when a unrealistic explanation of consequences and alternatives is required. A disputed issue is the extent to which courts should be relied upon to balance conflicting values. The prevalent seems to be that the function of weighting competing interests was placed in the hands of the agencies by Congress, and there it should remain. The main failing of the act so far has been the agencies' refusal to recognize its responsibility to consider environmental values at every stage leading to wasteful court review. (Sperling-Florida)
W76-00956

LEGAL MEASURES CONCERNING MARINE POLLUTION.
North Carolina State Univ., Raleigh.
Sea Grant Publication UNC-SG-75-04, February 1975. 83 p, 463 ref.

Descriptors: *North Carolina, *International law, *Water pollution, *Island, Oil, Grants, Projects, Water pollution effects, Research and development, Oil pollution, Water pollution control, Water pollution sources, Water quality control, Waste disposal, Legal aspects, International waters, Water law, Environmental effects, Law enforcement, Water resources development, Mineral industry, Waste dumps.
Identifiers: *Sea Grant projects.

This compilation of papers is a chronicle of new concepts and developments in marine pollution control. The articles presented were researched and written by students of International Laws at the University of North Carolina during the fall 1974 semester. One article discusses the use of the oceans as international disposal sites for industrial chemical waste materials. Another paper covers man-made islands and the relevant environmental objections to such structures, as well as legislation aimed at curbing pollution. Further, the use of man-made islands is considered in terms of feasibily for use in mineral extraction from the sea. In additionm probable cause requirements of the Fourth Amendment are explored in relation to vessel searches at sea. A new approach to pollution control on an international level is proposed.

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Finally, controversies in pollution control created as a consequence of the trans-Alaskan pipeline are delineated. (See W76-00964 thru W76-00969) (Hoffman-Florida)
W76-00963

POLLUTION OF THE HIGH SEAS: THE OCEANS AS INTERNATIONAL RIVERS,
North Carolina State Univ., Raleigh.
C. C. Stretch.
In: Legal Measures ConcerningMarine Pollution, Sea Grant Publication UNC-SG-75-04, p 1-11, February 1975. 62 ref.

Descriptors: *International law, *Jurisdiction, *Water pollution control, *Waste disposal, Legal aspects, Water pollution effects, Coasts, Ecosystems, Law of the sea, Riparian waters, Technology, International waters, Treaties, Penalties(Legal), Water law, Water rights, Riparian rights, Oceans, Judicial decisions.
Identifiers: *Co-riparians, Coastal watsers, Hazardous substances(Pollution), International agreements.

The development of man's legal systems eemingly lags behind the advance of technology. This is exemplified by an international legal system which grants general license to exploit the seas with a technology that threatens to destroy the marine environment. Contemporary needs call for a shift from traditional concepts of sovereignty and freedom of the seas to a concept more protective of the marine ecosystem and coastal resources. One commentator suggests that the oceans be viewed as international rivers with all states sharing the rights and liabilities of co-riparians. The suggestion is based on the proposition that the seas are the common and co-equal territory of every state. Asserting claims against co-riparians for unreasonable use of the international rivers would be made possible through this special territoriality. Three cases dealing with the international application of this proposition are analyzed, and a definition of actionable pollution activity under this theory is proposed. Criteria for defining the injury, for determining possession of the protected interests, and for establishing objective standards are presented. Possible defenses to such actions are also explored. (See also W76-00463) (Hoffman-Florida)
W76-00964

ARTIFICIAL ISLANDS: POSSIBILITIES AND LEGAL PROBLEMS,
North Carolina State Univ., Raleigh.
D. LeFebvre.
In: Legal Measures Concerning Marine Pollution, Sea Grant Publication UNC-SG-75-04 p 12-24, February 1975. 109 ref.

Descriptors: *Islands, *Floats, *Environmental effects, Natural resources, Water resources, Deep water, Economic feasibility, Oceans, Jurisdiction, Legal aspects, Aquatic habitats, International waters, Water rights, Law of the sea, Aquatic life, Water law, Water resources development, Mineral industry, Offshore platforms, Islands, Land use, Population.
Identifiers: *Artificial islands, *Deepwater ports.

With the realization that valuable mineral resources could be extracted profitably from the sea, part of the ocean's mystery disappeared. It became apparent that man-made islands offered great potential for mineral extraction. A brief history of two aborted attempts to form the islands of 'Taluga' and 'Abalonia' off the west coast near San Diego is presented. The purpose of these attempts was to form a base outside the territorial jurisdiction of the United States from which to harvest abundant supplies of lobsters and abalone. Some commentators opine that the law of the sea will have to answer the problem of dwindling land space, and permit some traditionally land based activities to be transferred to artificial islands. One marine science authority supports the view that offshore platforms are an economically feasible solution to population density and diminishing land space. Other proposed non-extractive uses of artificial islands include floating airports, floating oil storage tanks, and deepwater ports to accomodate supertankers. Jurisdictional problems which might arise regarding artificial islands are explored. (See also W76-00963) (Hoffman-Florida)
W76-00965

MARINE POLLUTION CONTROL AND MAN-MADE ISLANDS,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6G
W76-00966

FOURTH AMENDMENT PROBLEMS IN THE ENFORCEMENT OF MARINE CONSERVATION LAWS,
North Carolina State Univ., Raleigh.
P. Stam, Jr.
In: Legal Measures Concerning Marine Pollution, Sea Grant Publication UNC-SC-75-04, p 45-55, February 1975. 53 ref.

Descriptors: *Law enforcement, *Penalties(Legal), *Federal jurisdiction, *Constitutional law, Regulation, Water law, Water policy, Water quality control, Legal aspects, Political aspects, International law, Jurisdiction, Law of the sea, Federal government, Governments, Political constraints, Ships, Water pollution sources, Boats, Environmental effects.
Identifiers: *Vessels, Searches, Probable cause, Hazardous substances(Pollution), Fourth amendment.

The effectiveness of anti-pollution and fishery conservation laws depends in part on the enforcement methods used. The application of the probable cause requirement of the Fourth Amendment to search of vessels at sea is explored. Generally, a warrant based on probable cause is required to search for evidence of a crime; but there are exceptions. It is suggested that a search of vessels at sea may fall within the logic of these exceptions. One exception provides that any person crossing an international border into the United States may be required to submit to a search, regardless of whether probable cause exists. The rationale for a border search is that one who crosses the border expects to be searched and explicitly consents to it. Similarly, it is arguable that a vessel search at sea is the functional equivalent of a border search. Further, a vessel search is compared to two other common exceptions to probable cause searches: administrative searches, and searches of a business affecting the public interest. Additionally, the international problems associated with searching foreign vessels are also explored. (See also W76-00963) (Hoffman-Florida)
W76-00967

INTERNATIONAL OCEAN DUMPING OF INDUSTRIAL CHEMICAL WASTE,
North Carolina State Univ., Raleigh.
P. B. Stam, Sr.
In: Legal Measures Concerning Marine Pollution, Sea Grant Publication UNC-SG-75-04, p 56-71, February 1975. 92 ref.

Descriptors: *Federal Water Pollution Control Act, *Waste dumps, *Industrial wastes, *Chemical wastes, *Waste disposal, Pesticide residues, Legislation, Federal jurisdiction, Aquatic habitats, Organic pesticides, Organic wastes, Water quality control, Water law, Penalties(Legal), Pesticide removal, Standards, Waste treatment, Waste water(Pollution), Wastes, Waste water treatment, Pesticides, Regulation.
Identifiers: Ocean Dumping Act, Marine environment, Administrative regulations, Effluent limitations, Hazardous substances(Pollution), Federal Water Pollution Control Act Amendments of 1972.

The use of the oceans for disposal of in chemical waste materials on an internatio is discussed. Legislation passed by the States Congress in 1972 regulates the dis wastes into the marine environment. goals include complete control over and li of the disposal of harmful materials oceans. Title I of the Ocean Dumping designed to regulate dumping both wit beyond the territorial jurisdiction of the States. Civil and criminal provisions are p for violators. The objective of the Federa Pollution Control Act Amendments of 19 eliminate the discharge of pollutants into n waters by 1985. The details of both the ab are explored. Environmental Protection criteria for granting open water dumping and related problems are explored. Finally method for disposing of persistent pesti analyzed. This technique involves high t ture incineration of chlorinated organic conducted at sea in ships specially equi carry out the combustion. (See also W7 (Hoffman-Florida)
W76-00968

THE QUEST FOR OIL: A DECISIVE FO THE LAW OF THE ARCTIC SEA PERT TO POLLUTION,
North Carolina State Univ., Raleigh
J. C. Wyatt.
In: Legal Measures Concerning Marine P Sea Grant Publication, UNC-SG-75-04, February 1975. 68 ref.

Descriptors: *Alaska, *Canada, *Oil p *Water pollution control, Water pollution Oil industry, Oil fields, International law aspects, Jurisdiction, Oil spills, Oil was reservoirs, Legislation, International Pipelines, Water pollution sources, Wate tion, Water pollution treatment, Water Water Quality Act, Water quality control.
Identifiers: *Arctic waters, *Alaska Oil *Territorial jurisdiction, Hazardous stances(Pollution), International agreeme Pollution Act.

Discovery of the oil reserves of the North Alaska triggered the current interest a troversy regarding oil pollution control in tic. After years of litigation and despite the ical threats posed to the permafrost layer a wildlife, construction of the Trans-Alaska began in early 1974. As a result of the pip creasing attention has been focused on th waters. The efforts of the Canadian gover prevent future pollution culminated in the an Arctic Waters Pollution Prevention A comprehensive attempt to meet the thre types of water pollution in the Arctic. P concerning international jurisdiction of th waters are highlighted. Existing internati does not provide specific principles g ocean pollution. The present and future co sies concerning territorial jurisdiction of th waters demonstrate the need for an inter policy concerning ocean pollution (See al 00963) (Hoffman-Florida)
W76-00969

WATER RIGHTS,
Davis, Graham and Stubbs, Denver, Colo.
W. A. Hillhouse, II.
Annual Survey of American Law, Vol 19 255-264, Winter 1974. 73 ref.

Descriptors: *Groundwater resources, * groundwater relationships, *Federal-stat rights conflicts, *Rivers and Harbors Ac regulations, Federal jurisdiction, State tion, Judicial decisions, Water law, development, Monitoring, Control, Adm tive agencies, Prescriptive rights, Reasona Appropriation.

ers: *Groundwater rights, *Water
ces Council, *Implied reservation, Vested
Reserved use.

961, there have been major developments
er law regarding federal-state relations,
water use and regulation, and environmen-
rictions on federal water projects. The
iai Supreme Court applied the doctrine of
reservation in holding that the federal
nent has water rights where land under its
tion requires outside water sources. The
of adjucicating federal rights in state
as been eased by a 1971 Supreme Court
which held that the federal government
joined as a defendant to determine
as well as appropriated water rights. Sec-
of the Rivers and Harbors Act of 1970 al-
the no-compensation of navigational ser-
judicial doctrine by providing that a lan-
should be compensated for the highest and
of his property, including the value of
vigable waters. Litigation concerning the
groundwater users inter se has attempted
ate the common law rule that the overlying
ner has exclusive rights to subsurface
ith a reasonable use rule. Colorado has
several statutes dealing with groundwater
One requires a permit before appropriating
om a designated groundwater basin. When
or installation of wells poses a threat to
iate from related surface waters, its use
egulated. Several water conservation acts
in the 1960's have been applied by courts
re studies of adverse effects of water con-
ects, and regulations issued by the Water
es Council in 1973 should have a substan-
ct on state and local planning in this area.
-Florida)
974

IDE POLLUTION,
l Research Council, Washington, D. C.
ary bibliographic entry see Field 5C.
975

V. RILEY (ACTION BY RIPARIAN
S FOR INJUNCTION TO PROVIDE AC-
O LAKE).
ary bibliographic entry see Field 4A.
976

IK V. STATE OF WISCONSIN (APPEAL
CONVICTION FOR DIVERSION OF
S FROM LAKES AND STREAMS
UT A PERMIT).
ary bibliographic entry see Field 4A.
977

F DAYTONA BEACH V. TONA-RAMA,
ACTION FOR INJUNCTION TO
T ERECTION OF PUBLIC OBSERVA-
OWER ON BEACH).
ary bibliographic entry see Field 4C.
978

A NURSERIES, INC. V. DIVISION OF
STRATION, DEPARTMENT OF
ORTATION (APPEAL OF EMINENT
PROCEEDING FOR VIOLATION OF

ary bibliographic entry see Field 6A.
979

DEFENSE COMMITTEE V. THIERMAN
UNDER NEPA TO COMPEL A
HEARING BEFORE ISSUING PER-

pp. 91 (S. D. New York 1974).

ors: *Judicial decisions, *New York,
*Administration, *Adoption of prac-
tices, Legal review, Regulation, Construction, Shoreline, Federal jurisdiction, Land reclamation, United States, Planning, Administrative agencies, Decision making, Water policy, Bulkheads.
Identifiers: *National Environmental Policy Act, *Injunctive relief, *Land ownership, *Statues.

An action was brought under the National Environmental Policy Act against the District Engineer of the United States Corps of Engineers. The Southern District Court of New York held that a hearing was necessary before issuing a permit for construction of a bulkhead and the placement of landfill shoreward for the purpose of building a family dwelling. The court also held that federal agencies must establish reviewable environmental records. The jurisdiction of a federal court under the National Environmental Policy Act extends only to review of compliance with congressional dictates and the agency's own regulations. Policy determinations are left to the expertise of the agency. (Sperling-Florida)
W76-00980

BOONE V. TILLATOBA CREEK DRAINAGE DISTRICT (SUIT SEEKING INJUNCTIVE RELIEF WITH RESPECT TO PROPOSED DRAINAGE PROJECT).
379 F. Supp 1239 (N D Miss 1974).

Descriptors: *Mississippi, *Federal jurisdiction, *Judicial decisions, *Drainage districts, Project planning, Drainage program, Drainage systems, Water policy, Administration, Water management(Applied), Standards, Legal review, Administrative agencies, Decision making, Adoption of practices.
Identifiers: *Injunctive relief, *National Environmental Policy Act, *Burden of proof, *Environmental impact statement, *Tallahatchie and Yalobusha Counties(Miss).

An action was brought in the United States District Court for northern Mississippi seeking to enjoin a proposed drainage project. The court held that in determining the sufficiency of the environmental impact statement and further compliance with the National Environmental Policy Act, the burden of proof is on the plaintiffs to prove by a preponderance of the evidence that the defendents failed to adhere to the requirements. The National Environmental Policy Act sets standards of limited review of substantive ecological decisions made by federal agencies under the Administrative Procedure Act. In light of substantial reasons for proceeding with the drainage district project, the court could not substitute its judgement for that of federal authorities legally authorized to design and implement the project. No evidence was offered to show that the federal agency acted arbitrarily or irrationally in recommending the project. (Sperling-Florida)
W76-00981

GARDINIER, INC. V. FLA. DEPT. OF POLLUTION CONTROL (PETITION FOR WRIT OF CERTIORARI TO DETERMINE THE VALIDITY OF AN ORDER OF THE DEPARTMENT OF POLLUTION CONTROL).
For primary bibliographic entry see Field 5B.
W76-00982

MARINE TOWING, INC. V. RED STAR TOWING AND TRANSPORTATION CO. (ACTION FOR DAMAGES SUFFERED WHEN TUG STRUCK A WRECK IN NAVIGABLE WATERS).
381 F Supp 619 (E D New York 1973).

Descriptors: *New York, *Judicial decisions, *Boating regulations, Legal aspects, Boats, Harbors, Negligence, Remedies, Damages, State jurisdiction, Safety, Water law, Hazards, Accidents.
Identifiers: *Statutes.

An admiralty action was brought in federal District Court by a tugboat owner for damages suffered when it struck a wreck. The court held the Coast Guard's placing of a flag and lantern on the mast and direction of ships around the wreck did not relieve the wreckowner of its duties under the Wreck Statute. The owner was held in violation of the statute for failing to keep watch until the Coast Guard had marked the wreck with a more permanent buoy. In addition, the court found that where both the tugboat owner and the owner of the wreck were negligent each was liable for half of the damage. (Sperling-Florida)
W76-00983

LEGAL ASPECTS OF PHOSPHATE MINING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6G.
W76-00984

TANKERS AND THE MARINE ENVIRONMENT, PART I.
For primary bibliographic entry see Field 5B.
W76-00985

DISAPPROVAL OF THE DEFERRAL OF WATER POLLUTION CONSTRUCTION GRANT FUNDS.
For primary bibliographic entry see Field 6C.
W76-00986

HUMAN ECOLOGY. PROBLEMS AND SOLUTIONS,
For primary bibliographic entry see Field 5C.
W76-00987

TRANSACTIONS OF THE THIRTY-EIGHTH NORTH AMERICAN WILDLIFE AND NATURAL RESOURCES CONFERENCE, WASHINGTON, D.C., MARCH 18-21, 1973.
For primary bibliographic entry see Field 6G.
W76-00997

6F. Nonstructural Alternatives

FLOOD-HAZARD STUDY--100-YEAR FLOOD STAGE FOR APPLE VALLEY DRY LAKE, SAN BERNARDINO COUNTY, CALIFORNAI,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4A.
W76-00659

A LAND USE DECISION METHODOLOGY FOR ENVIRONMENTAL CONTROL,
Rocky Mountain Center on Environment, Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-00683

WEATHER MODIFICATION LAW DEVELOPMENTS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2B.
W76-00923

MINERAL DEVELOPMENT AND THE ENVIRONMENT: LEGAL REFORMS FOR THE SITING OF MAJOR FACILITIES,
For primary bibliographic entry see Field 6E.
W76-00925

ENVIRONMENTAL LAW: WEATHER MODIFICATION-PROPOSED FEDERAL LEGISLATION AND THE OKLAHOMA WEATHER MODIFICATION ACT,
For primary bibliographic entry see Field 6E.
W76-00928

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CUSTOMARY USE OF FLORIDA BEACHES,
For primary bibliographic entry see Field 6E.
W76-00929

UNITED STATES V GAF CORPORATION (ACTION FOR INJUNCTIVE RELIEF FROM DISPOSAL OF ORGANIC WASTES BY DEEP WELL INJECTION).
For primary bibliographic entry see Field 5B.
W76-00938

CHEMEHUEVI TRIBE OF INDIANS V FEDERAL POWER COMMISION (ACTION TO DETERMINE JURISDICTION OF FPC OVER THERMAL ELECTRIC POWER PLANTS LOCATED ON NAVIGABLE STREAMS).
For primary bibliographic entry see Field 6E.
W76-00947

HAYS, KANSAS, FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 8A.
W76-00973

WATER RIGHTS,
Davis, Graham and Stubbs, Denver, Colo.
For primary bibliographic entry see Field 6E.
W76-00974

6G. Ecologic Impact Of Water Development

CITIZEN ENFORCERS: INFLUENCING WATER RESOURCES ALLOCATION DECISIONS,
Georgia Inst. of Tech., Atlanta. Inst. of Government.
For primary bibliographic entry see Field 5G.
W76-00505

VALLEY FORGE AREA WASTEWATER TREATMENT FACILITY, CHESTER COUNTY, PENNSYLVANIA, FINAL ENVIRONMENTAL IMPACT STATMENT.
Environmental Protection Agency, Philadelphia, Pa. Region III.
For primary bibliographic entry see Field 5D.
W76-00508

INTERCEPTOR SEWERS AND SUBURBAN SPRAWL: THE IMPACT OF CONSTRUCTION GRANTS ON RESIDENTIAL LAND USE. VOLUME I, ANALYSIS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W76-00515

MAN'S ACCELERATION OF HYDROGEOCHEMICAL CYCLING OF PHOSPHORUS: EUTROPHICATION OF INLAND AND COASTAL WATERS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W76-00620

ENVIRONMENTAL ASPECTS--SACRAMENTO BANK PROTECTION,
Army Engineer District, Sacramento, Calif. Water Resources Planning Branch.
For primary bibliographic entry see Field 4D.
W76-00621

TROUBLE IN PARADISE,
Clark Univ., Worcester, Mass. Dept. of Environmental Affairs
For primary bibliographic entry see Field 5G.
W76-00625

PROBLEMS OF SCALE AND DETAIL IN ECOLOGICAL MODELLING,
Utah State Univ., Logan. Ecology Center
D. W. Goodall
Journal of Environmental Management, Vol 2, No 2, p 149-157, April 1974. 1 ref.

Descriptors: *Model studies, *Ecosystems, Dynamics, *Ecology.
Identifiers: *Ecosystem models, Niche structure.

The importance of niche structure in ecosystem dynamics is emphasized. This implies that an ecosystem model which ignores species differences runs the rish of neglecting important elements in its dynamics. Unless circumstances permit direct comparison of a simplified model with the observed behavior of a representative range of eco systems, it is recommended that acceptance of the simplified model be based on a demonstration that deviations from the behavior of an alternative model taking biological diversity fully into account are negligible for the purposes in question. Spatial heterogeneity, like biological diversity, may contribute greatly to the dynamics of an ecosystem, and a simplified model which ignores it should be accepted only if justified either by an empirical test or by a comparison with a more complex model taking the heterogeneity into account. (Skogerboe-Colorado State)
W76-00739

ENVIRONMENTAL ASPECTS OF SOLAR ENERGY APPLICATIONS,
Arizona Univ., Tucson. Opitical Sciences Center.
For primary bibliographic entry see Field 3E.
W76-00755

THERMAL POWER PLANT SITING IN AN ARID REGION-ENVIRONMENTAL CONSTRAINTS,
Bechtal Power Corp., Los Angeles, Calif.
For primary bibliographic entry see Field 3E.
W76-00759

ENVIRONMENTAL COSTS FOR THE NAVAJO GENERATING STATION,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 5D.
W76-00761

NUCLEAR SHIP POLLUTION: NATIONAL AND INTERNATIONAL REGULATION AND LIABILITY,
For primary bibliographic entry see Field 6E.
W76-00921

OCEAN SPACE FOR MANKIND: INTERNATIONAL LAW OF THE SEA,
Royal Univ. of Malta, Msida.
S. J. Holt.
Environmental Conservation, Vol 1, No 2, p 138, 1974.

Descriptors: *International law, *United Nations, *Law of the sea, International waters, Foreign countries, Exploitation, Mining, Regulation, Governments, Treaties, Political constraints, Boundary disputes, Legal aspects, Administration, Beds, Beds under water, Management, International commissions, Governmental interrelations.
Identifiers: *United Nations Conference on the Law of the Sea(UNCLOS), *Non-governmental organizations(NGO's), *Pecem in Maribus, Territorial waters.

During 1974, representatives of many g
ments met to frame a new body of laws f
governance of the ocean and its resources
the aegis of the United Nations Conference
Law of the Sea (UNCLOS), participants agr
consider practically all aspects of intern
marine problems, including minerals, pol
fisheries, and territorial waters. Many non-g
mental organizations (NGO's) have also exp
their concern over the growing tendency of
to extend their authority over ocean space
groups advocate international manageme
only of the international seabed, but of
space as a whole, including the water c
above, all ocean resources, and even the air
above the oceans. These NGO's are see
common position on the main policy issues
Law of the Sea Conference. (Parrish-Florid
W76-00922

WEATHER MODIFICATION LAW DEV
MENTS,
Arizona Univ., Tucson
For primary bibliographic entry see Field 2B
W76-00923

DEPARTMENT OF NATURAL RESOUR
MAYOR AND COUNCIL OF OCEAN
(ACTION BY OWNER OF LAND TO RE
OCEAN FRONT TRACT TO ENJOIN
STRUCTION OF CONDOMINIUM).
332 Atlantic Reporter, 2d series, p 630-6
App. Md. 1975).

Descriptors: *Littoral, *Riparian land,
law, *Public rights, *Prescriptive rights,
land, Easements, Water rights, Recreation,
ing codes, Regulations, Local governments
development, Land tenure, Judicial decision
Identifiers: *Public trust, *Shoreline, L
dedication, Condominiums, Foreshore,
easements, Littoral proprietorship, Injun
Custom.

Plaintiff, owner of land behind a proposed
front condominium site, sued to enjoin co
tion of the condominium on the grounds t
general public has acquired an easement b
the mean high water mark and the line of
tion, and construction of the building b
those lines would deny public use of the
The Maryland Court of Appeals held that in
a dedication solely through long public us
sititued prescription. Thirteen years of pub
failed to meet that test. Defendant's ac
were not a violation of the public trust when
unclear whether property which was not sh
at the time of the state charter was later sub
the reservation. Moreover, mere expendit
public funds on restoring the dunes did n
press the property with a public trust. The
also rejected plaintiff's argument that fast l
undated by mean high water reverts to
ownership when submersion is caused by
sion, rather than gradual erosion. Tem
flooding which does not change the land do
effect a reversion. The dissent argued th
public easement could be predicated on the
of an implied dedication. Judgement was
fendant. (Jenkins-Florida)
W76-00936

AMENDING THE WILD AND SCENIC R
ACT OF 1968 BY DESIGNATING A SEG
OF THE NEW RIVER AS A POTENTIAL
PONENT OF THE NATIONAL WILD
SCENIC RIVERS SYSTEM.
Report--Committee on Interior and Insul
fairs, House of Representatives, Report
1419, 93d Cong, 2d Sess, October 3, 1974. 23

Descriptors: *Wild River Act, *Adminis
decisions, *Legislation, *Interstate rivers,
Carolina, Virginia, West Virginia, Adminis
agencies, Governmental interrel

electric plants, Hydroelectric project
ng, Institutional constraints, Hydroelectric
, Federal Power Act.
iers: Wilderness areas, New River, Energy
Congressional hearings, Dam effects, En-
ental impact statements, Department of the
r, Federal Power Commission(FPC).

9 amends the Wild and Scenic Rivers Act of
y designating a segment of the New River as
ntial component of the national wild and
rivers system. The amended bill authorizes
retary of Interior to complete a study of the
nd report the results to the President and the
ess within two years of enactment of the
tion. Further legislation is required to ac-
designate any part of the New River as a
nent of the national wild and scenic rivers
. The southern fork of New River which
from northwestern North Carolina into Vir-
as been identified by a statewide assess-
s having primary recreational importance.
ederal Power Commission has licensed a
lectric project, the Blue Ridge Project, to
structed on the upper New River. The dam
innundate nearly 100 miles of the New
The Environmental Protection Agency
has questioned the recreational value of the
. The Federal Power Commission has ar-
hat New River is neither legally wild nor
and has minimal recreational value. In the
to the subcommittee report, it was argued
ssage of S. 2439 would effectively kill the
idge Project. (Jenkins-Florida)
0937

TENANCE OF TARRYTOWN HARBOR, YORK, NAVIGATION PROJECT (FINAL ONMENTAL IMPACT STATEMENT).
Engineer District, New York.
mary bibliographic entry see Field 8A.
0940

O CONTROL ON SAGINAW RIVER, GAN AND TRIBUTARIES, FLINT RIVER INT, SWARTZ AND THREAD CREEKS, ONS C-1 AND D, MICHIGAN (FINAL EN- MENTAL IMPACT STATEMENT).
Engineer District, Detroit, Mich.
mary bibliographic entry see Field 8A.
0941

CEMENT OF LOCK AND DAM 7 AND 8, MONONGAHELA RIVER PENNSYL- (FINAL ENVIRONMENTAL IMPACT MENT).
Engineer District, Pittsburgh, Pa.
mary bibliographic entry see Field 8A.
0943

MBIA AND LOWER WILLAMETTE S BELOW VANCOUVER, WASHING- AND PORTLAND, OREGON, HTERS BAR REACH (FINAL ENVIRON- AL IMPACT STATEMENT).
Engineer District, Portland, Oreg.
mary bibliographic entry see Field 8A.
0944

EHUEVI TRIBE OF INDIANS V AL POWER COMMISION (ACTION TO MINE JURISDICTION OF FPC OVER IAL ELECTRIC POWER PLANTS ED ON NAVIGABLE STREAMS).
mary bibliographic entry see Field 6E.
0947

ETON V. HUSS (ACTION FOR INJUNC- RELIEF FOR INCREASED SURFACE RUNOFF).
mary bibliographic entry see Field 4B.
0953

BLOUNT ISLAND DEVELOPMENT, JACKSONVILLE, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 8A.
W76-00957

MARBLE BLUFF DAM AND PYRAMID LAKE FISHWAY, WASHOE PROJECT, NEVADA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
For primary bibliographic entry see Field 8A.
W76-00958

GAS HOUSE COVE (EAST HARBOR FACILITY), SAN FRANCISCO MARINA SMALL CRAFT HARBOR, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineers District, San Francisco, Calif.
For primary bibliographic entry see Field 8A.
W76-00959

NAVIGATION OF THE KANSAS RIVER, LAWRENCE TO THE MOUTH (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 8A.
W76-00960

PERMIT APPLICATION BY RADCLIFF MATERIALS, INC. DREDGING OF DEAD-REEF SHELLS, MOBILE BAY, ALABAMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 8H.
W76-00961

LAKE BLUFF BEACH EROSION CONTROL, ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 8A.
W76-00962

POLLUTION OF THE HIGH SEAS: THE OCEANS AS INTERNATIONAL RIVERS,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6E.
W76-00964

MARINE POLLUTION CONTROL AND MAN-MADE ISLANDS,
North Carolina State Univ., Raleigh.
S. A. Butts, III.
In: Legal Measures Concerning Marine Pollution, Sea Grant Publication UNC-SG-75-04, p 25-44, February 1975. 179 ref.

Descriptors: *Federal Water Pollution Control Act, *Island, *Floats, *Environmental effects, *Rivers and Harbors Act, Aquatic habitats, Legislation, Natural resources, Water resources, Oceans, Oil, International law, International waters, Legal aspects, Jurisdiction, Water rights, Law of the sea, Water law, Water resources development.
Identifiers: *Man-made islands, *Floating structures, *Coastal Zone Management Act.

Man-made islands may be divided into four categories differentiated on the basis of their construction: floating structures maintained in a fixed position by attachment to the ocean floor; structures fixed on sea floor by means of caisson-like tubes sunk into the bottom; concrete structures; and islands created by the dumping of natural materials, such as rock and gravel. Environmental objections have been raised regarding such man-made islands, with particular focus on oil related structures. National and international pollution laws which pertain to man-made islands are summarized. Special attention is directed towards oil drilling platforms and superports, constructed and operated by the United States or its citizens. Legislation explored includes the Federal Water Pollution Control Act Amendments of 1972; the Rivers and Harbors Act of 1899; the Outer Continental Shelf Lands Act; the Ports and Waterways Safety Act of 1972; Coastal Zone Management Act of 1972; the National Environmental Policy Act of 1969; Marine Protection, Research, and Sanctuaries Act of 1972; and the proposed Deepwater Port Act. In addition, an analysis of pertinent international law is presented. (See also W76-00963) (Hoffman-Florida)
W76-00966

BIG CYPRESS NATIONAL PRESERVE (PART 2-APPENDIX).
For primary bibliographic entry see Field 4C.
W76-00970

GREENVILLE HARBOR, MISSISSIPPI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 8A.
W76-00971

GEORGETOWN CREEK WATERSHED PROJECT, BEAR LAKE COUNTY, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Boise, Idaho.
For primary bibliographic entry see Field 8A.
W76-00972

HAYS, KANSAS, FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 8A.
W76-00973

CHIPOLA NURSERIES, INC. V. DIVISION OF ADMINISTRATION, DEPARTMENT OF TRANSPORTATION (APPEAL OF EMINENT DOMAIN PROCEEDING FOR VIOLATION OF NEPA).
For primary bibliographic entry see Field 6A.
W76-00979

LEGAL ASPECTS OF PHOSPHATE MINING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh.
M. A. Almond.
Sea Grant Publication UNC-SG-75-05, February, 1975. 29 p, 167 ref, append.

Descriptors: *North Carolina, *Phosphates, *Mining, *Environmental effects, Dreding, Excavation, Exploitation, Exploration, Underground structures, Balance of nature, Ecology, Aquatic habitats, Eutrophication, Regulations, Remedies, Land reclamation, Groundwater, Air pollution, Fertilizers, Minerology.
Identifiers: Underwater mining, Phosphate mining.

The removal of phosphates from beneath navigable waters in North Carolina may produce adverse effects upon marine life adjacent to the operation. On the other hand, the phosphate is critically needed to provide fertilizer to increase crop yields in a hungry world. The pertinent state statutes and legal thinking likely to be used in the administrative or legal solution of this problem are analyzed. The on-land phosphate mining process can cause environmental problems in three areas: air pollution, land reclamation, and groundwater. Underwater mining could also cause major problems, such as salt water intrusion, eutrophication, and ir-

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reparable damage to the state's shrimp industry. Several legal remedies are explored that might insure that the future development of phosphate mining is consistent with the preservation of estuarine resources. These remedies are governmental regulations, private remedies, contractual remedies, and the good faith of the mining industry. Any such solutions must depend in large part on the presence and spirit of one corporation, Texasgulf, Inc.; mainly because Texasgulf is at present the only company mining phosphate in the state. (Hoffman-Florida)
W76-00984

TRANSACTIONS OF THE THIRTY-EIGHTH NORTH AMERICAN WILDLIFE AND NATURAL RESOURCES CONFERENCE, WASHINGTON, D.C., MARCH 18-21, 1973.
Wildlife Management Institute: Washington, D.C., 1973, 525 p, Illus, Maps.

Descriptors: *Priorities, *Natural resources, Human Population, Oil shales, Conferences.
Identifiers: Coastal zone.

This volume contains papers on various aspects of natural resources and national priorities. Part 1 discusses actions needed to benefit resources and people, covering such topics as science and society in the age of environment and impact of population growth on resources and the environment. The status and needs of rare and endangered species is discussed including such topics as dwindling and endangered ungulates of Chile and comparative productivity of 5 bald eagle populations. A section on planning for intensive resource management covers Canada's inventory of land-wildlife capabilities and political economy of water resources development. Balancing human, wildlife and fish needs are discussed in relation to such topics as restricting human use of public lands in North America and environmental planning for oil shale production in western Colorado, USA. The final section, priorities in resource management, discusses balancing demands for natural resources, federal organization to meet resource needs and a progress report on coastal zone management. Lists of literature cited as well as discussion accompanies the contributed papers. Individual papers are indexed in BIORESEARCH INDEX.--Copyright 1974, Biological Abstracts, Inc.
W76-00997

7. RESOURCES DATA

7A. Network Design

STUDIES ON OPERATIONS PLANNING AND CONTROL OF WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W76-00506

7B. Data Acquisition

A GEOPHYSICAL METHOD FOR DETERMINATION OF AQUIFER PARAMETERS OF HARD ROCKS,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 2F.
W76-00529

EMPIRICAL METHODS OF USING SOILS AS RADIATION DOSIMETERS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5A.
W76-00542

A DUAL-INTERVAL, LIGHT-ACTIVATED SIGNAL GENERATOR--ITS APPLICATION TO SEDIMENT SAMPLING,
Agricultural Research Service, Chickasha, Okla
For primary bibliographic entry see Field 2J
W76-00543

DEPOSITION RATES IN VALLEYS DETERMINED USING FALLOUT CESIUM-137,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W76-00547

WATER MONITORING STATIONS,
Honeywell, Inc., Minneapolis, Minn.
For primary bibliographic entry see Field 5A.
W76-00605

HYDROLOGIC DATA NETWORK FOR THE OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N. Y.
J. M. Whipple, and K. I. Darmer.
Administrative Report, September 1975. 64 p, 3 fig, 2 plate, 8 tab, 46 ref, append.

Descriptors: *Hydrologic data, *Network design, *Data transmission, *Satellites(Artificial), *New York, River basins, Water quality, Streamflow, Lakes, Water levels, Runoff, Flood forecasting, Planning, Methodology, Remote sensing, Telometry.
Identifiers: *Oswego River basin(NY), Real-time data.

Data from proposed ultimate real-time data network of 17 precipitation gages, 33 stream- flow stations, and 11 lake-stage stations would be transmitted to a central location for use in flood forecasting and in providing for optimum use of the water resources of the Oswego River basin in New York. A three-phase implementation of the network is proposed to provide (1) new data-collection stations, (2) perfection of transmission of data by satellite, and (3) ultimate conversion to a real-time data system. (Woodard-USGS)
W76-00654

APPLICATION OF MICROWAVE WATER SENSING TECHNIQUES TO WATERSHEDS,
Montana State Univ., Bozeman. Dept. of Electrical Engineering.
B. R. McLeod.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 196, $3.75 in paper copy, $2.25 in microfiche. Research Report No 67, Montana University Joint Water Resources Research Center, Bozeman, July 1975. 35 p, 8 fig, 9 tab, 2 ref. OWRT A-079-MONT(1).

Descriptors: *Instrumentation, *Moisture meters, *Electronic equipment, *Microwaves, *Watershed management, Measurement, *Moisture content, Humidity, Litter, *Forests watersheds.
Identifiers: *Microwave meters, Forestry instrumentation.

The feasibility of applying microwave moisture sensing techniques to the area of watershed management is discussed. A portable, field-usable microwave meter was developed to given rapid, accurate moisture information on such forest fuels as litter, duff, and dead sticks between 1/4 and 1/2 inch in diameter. The meter weighs 23 pounds, is powered by two rechargeable batteris, and is packaged in a small fiberglass case that insures the meter will operate in a field environment such as a fire camp. The unit has been field-tested for three years with the final year's data being used to calibrate the meter. The project also produced a second type of meter using the same principle of microwave moisture sensing. This instrument monitors, on a real-time basis, changes in forest fuel moisture content in response to changes
ternal stimuli such as humidity changes. Prel
ry results show very rapid changes in m
content for litter as compared to presen
cepted numbers for the time rate of change
moisture content of litter. (Holje-Montana S
W76-00675

**INVESTIGATION OF THE ORION RESE
CYANIDE MONITOR,**
Environmental Protection Agency, Cinc
Ohio.
For primary bibliographic entry see Field 5A
W76-00677

**SEWERAGE SYSTEM MONITORING
REMOTE CONTROL,**
Detroit Metro Water Dept., Mich.
For primary bibliographic entry see Field 5D
W76-00691

**ESTIMATING EVAPORATION: A TECHN
ADAPTABLE TO REMOTE SENSING,**
Agricultural Research Service, Phoenix, Water Conservation Lab.
For primary bibliographic entry see Field 2D
W76-00701

AN AUTOMATIC PUMPING SAMPLER EVALUATING THE TRANSPORT OF I CIDES IN SUSPENDED SEDIMENT,
For primary bibliographic entry see Field 5B
W76-00728

SMALL TENSIOMETERS FOR FIELD LABORATORY STUDIES,
Agricultural Research Service, Gainesville,
For primary bibliographic entry see Field 2G
W76-00733

CONTINUOUS READING LOW RANGE BIDIMETER MODEL 1720.
Hach Bulletin 1720-3ED, 1971. 2 p, 3 fig.

Descriptors: *Instrumentation, *Turb
*Treatment facilities, Water quality, Monit
Equipment.
Identifiers: Formazin Turbindity Unit(
*Turbidimeter.

The model 1720 Hach Low Range Turbidi
offers water treatment plants an economica
of providing continuous information
finished water quality. With the lowest of it
ranges, this instrument can measure turbidit
low as 0.04 Formazin Turbidity Unit (FTU).
surement of turbidity is accomplished by pas
strong beam of light through the sample. Tu
ty, present as fine particles, scatters a port
the light beam which is measured by
photocells submerged in the sample; an indi
is obtained on the readout meter. This
tenance-free instrument has a response time
tect a change in turbidity of 30 seconds requi
sample of 1/4 to 1/2 gallon/minute and measu
inches in length by 4 1/8 inches in dia
(Sandoski-FIRL)
W76-00764

**EVALUATION OF SURFACE WA
RESOURCES FROM MACHINE-PROCES
OF ERTS MULTISPECTRAL DATA,**
Indiana State Univ., Terre Haute. Dept. of
raphy and Geology.
For primary bibliographic entry see Field 5G.
W76-00833

**ASSESSING SOIL SALINITY AND IDENT
ING POTENTIAL SALINE-SEEP AREAS
FIELD SOIL RESISTANCE MEASUREMEN**
Agricultural Research Service, Sidney, Mont

ıary bibliographic entry see Field 3C.
335

TEST OF SOIL WATER FLUX METERS,
ural Research Service, Riverside, Calif.
Lab.
ıary bibliographic entry see Field 2G.
338

ROLYTIC WATER TESTER-FOR
MINATION OF OXYDANT OR REDUC-
ENT CONTENT.
ıary bibliographic entry see Field 5D.
341

NG ICE THICKNESS AND STRUC-
DETERMINATION--HEATED WIRE
IQUE,
ent of the Environment, Ottawa
). Inland Waters Directorate.
ary bibliographic entry see Field 2C.
84

COLOUR MEASUREMENTS ON THE
LAKES,
Centre for Inland Waters, Burling-
rio).
ary bibliographic entry see Field 5A.
85

RMANCE CHARACTERISTICS OF
EFFECT' HUMIDITY SENSORS,
Bureau of Standards, Washington, D. C.,
cs Div.
tle, S. Hasewaga, and L. Greenspan.
e from the National Technical Informa-
vice, Springfield, Va 22161 as COM-74-
4.00 in paper copy, $2.25 in microfiche.
4-477, 1974. 31 p, 5 fig, 9 tab, 7 ref.

ors: *Humidity, *Temperature, Hystere-
dards, Calibrations, Air temperature, In-
ation, Measurement, Water vapor,
etry, Laboratory tests, Climates.
rs: *Humidity sensor, *Aluminum oxide,
temperature, Sensitivity, Hysteresis
alibration scatter, Bulk effect, 'Brady
nsor.

tory study was made of the performance
' Array' humidity sensors over a range of
emperature from -40 to + or -20C encom-
relative humidities from 0 to 90%. The
turer categorized this sensor as a solid-
niconductor device comprising a 'precise
crystals and interstitial spaces.' It was
within a slotted TO-5 transistor enclo-
excitation oscillator, driven by a dc input
s, provided a 5-volt rms 1000-Hz signal to
r and a demodulator provided a dc output
rying in magnitude from 0 to 5 volts. This
was measured with a digital voltmeter
l to within + or -0.3 mV or less for all
nents reported. Each of two excitation
s was connected through appropriate ca-
ve sensors and demodulators. There was
iability in the set of ten sensors used in
. The sensitivity of individual sensors
a factor of at least three. There was con-
ambient temperature effect, so that each
d to be calibrated according to the tem-
range of the intended use. Sensors were
eful at low temperatures or low relative
s as at higher temperatures and relative
s. (Roberts-ISWS)
6

7C. Evaluation, Processing and Publication

WATER RESOURCES OF HANCOCK COUNTY WITH EMPHASIS ON GROUND-WATER AVAILABILITY,
Indiana Dept. of Natural Resources, Indianapolis. Div. of Water.
J. E. Uhl.
Annotated Map, 1975. Folded sheet, 4 fig, 6 tab, 1 map.

Descriptors: *Water resources, *Groundwater availability, *Maps, *Indiana, Groundwater, Surface waters, Water quality, Geology, Water sources, Water supply, Aquifers, Groundwater resources, Wells, Water yield, Hydrogeology.
Identifiers: Hancock County(Ind).

Potential yield from groundwater supplies in Hancock County, Indiana, were plotted on a large scale map (1 inch=1 mile). Other related information was presented on the reverse side of the map. Data on the geography, population, climate, surface water, water quality, and geology of the county were included. The three existing public water supplies in Hancock County were described. (Sims-ISWS)
W76-00534

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W76-00535

A CONTINUOUS GARGANTUAN TASK FOR SEVERN TRENT,
Severn Trent Water Authority (England).
For primary bibliographic entry see Field 5A.
W76-00640

THE SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 4. ST. LAWRENCE RIVER BASIN--VOLUME 1. BASINS OF STREAMS TRIBUTARY TO LAKES SUPERIOR, MICHIGAN, AND HURON,.
Geological Survey, Reston Va.
Available from Supt. of Documents, GPO, Wash. D.C. 20402, price $5.10 Geological Survey Water-Supply Paper 2111, 1974. 754 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Flow rates, *St. Lawrence River, River basins, Lake Superior, Lake Michigan, Lake Huron, Discharge(Water), Gaging stations, Flow measurement, Average flow, Water levels, Lakes, Reservoirs, Hydrologic data.
Identifiers: Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the St. Lawrence River basin, streams tributary to Lakes Superior, Michigan, and Huron. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W76-00651

GROUND-WATER LEVELS IN THE UNITED STATES, 1969-73: SOUTH-EASTERN STATES.
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Wash., D.C. 20420, price $2.45. Water-Supply Paper 2171, 1975. 250 p, 12 fig, 3 ref.

Descriptors: *Basic data collections, *Groundwater, *Water wells, *Water levels, *Southeast U. S., Observation wells, Hydrologic data, Alabama, Florida, Georgia, Kentucky Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginai, Aquifers, Water utilization, Groundwater resources.

Five years (1969-73) of water-level measurements in 11 states in southeastern United States are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month. (Woodard-USGS)
W76-00652

GROUND-WATER BASIC DATA FOR GRANT AND SIOUX COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. DAK.
P. G. Randich.
North Dakota, Geological Survey, Bismarck, County Ground-Water Studies 24--Part II, and North Dakota Geological Survey Bulletin 67--Part II, 1975. 303 p, 2 fig, 1 plate, 8 tab, 23 ref, append.

Descriptors: *Basic data collections, *Groundwater resources, *Water quality, *Lithologic logs, *North Dakota, Water wells, Well data, Aquifer characteristics, Hydrogeology, Water levels, Groundwater recharge, Streamflow, Low flow, Chemical analysis, Particle size.
Identifiers: *Grant County(ND), *Sioux County(ND).

Groundwater data for Grant and Sioux Counties, N. D., were collected chiefly between 1971 and 1974. The data include: (1) Geologic and hydrologic records for 1,610 wells and test holes; (2) water-level measurements in 77 observation wells; (3) lithologic and geophysical logs of 257 test holes and wells; (4) 135 chemical analyses of groundwater; (5) 15 chemical analyses of water from streams during low flow; (6) 13 chemical analyses of minor elements in water from wells; (7) 30 particle-size distribution graphs; and (8) 30 analyses of core samples for hydraulic parameters and heavy mineral content. (Woodard-USGS)
W76-00653

HYDROLOGIC DATA NETWORK FOR THE OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 7B.
W76-00654

THE GROUND-WATER SITUATION IN THE CIRCLEVILLE AREA, PICKAWAY COUNTY, SOUTH-CENTRAL OHIO,
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 4B.
W76-00661

MAP SHOWING FLOOD-PRONE AREAS, COLORADO SPRINGS-CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
J. F. McCain, and W. R. Hotchkiss.

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For sale by USGS, Reston, Va 22090, price $0.75. Miscellaneous Investigations Services Map I-857 C, 1975. 1 sheet, 1 map, 9 ref.

Descriptors: *Flood plains, *Maps, *Urbanization, *Flood protection, *Colorado, Flood frequency, Land development, Land use, Streamflow, Flow characteristics, Hydrologic data, Flood plain zoning, Watershed management.
Identifiers: *Colorado Springs(Colo), *Castle Rock area(Colo).

The rapid growth of population in the Front Range Urban Corridor of Colorado is causing intense competition for available land resources. One form of competition posing serious problems is unregulated development along natural watercourses. This map depicts a broad-scale view of flood-prone areas along principal streams in the Colorado Springs-Castle Rock area of the urban corridor. Flood-prone areas identified are subject to inundation by the 100-year flood, a flood having a 1 percent change of being equaled or exceeded in any given year. The magnitude and depth of the reference flood were derived for streams in the study area from streamflow records and reports of the U.S. Geological Survey and from reports of the U. S. Army Corps of Engineers. (Woodard-USGS)
W76-00668

MAP SHOWING AVAILABILITY OF HYDROLOGIC DATA PUBLISHED AS OF 1974 BY THE U.S. ENVIRONMENTAL DATA SERVICE AND BY THE U.S. GEOLOGICAL SURVEY AND COOPERATING AGENCIES, COLORADO SPRINGS-CASTLE ROCK AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
L. O. Anna.
For sale USGS, Reston, Va 22092, price $0.75. Miscellaneous Investigations Series Map I-857-D, 1975. 1 sheet, 1 map, 26 ref.

Descriptors: *Hydrologic data, *Maps, *Surface waters, *Groundwater, *Colorado, Sites, Climatic data, Streamflow, Water quality, Publications, Information retrieval, Watershed management, Planning, Urbanization.
Identifiers: *Colorado Springs, *Castle Rock area(Colo).

This map shows by symbols and color the hydrologic data published as of January 1974 for the Colorado Springs-Castle Rock Colo., area by the U.S. Environmental Data Service and by the U.S. Geological Survey and cooperating agencies. All sources of the data are given in the references and are referred to in the discussion. Of the 44 climatological stations shown the longest precipitation records are for Fountain, Colo., beginning in 1866. Colorado Springs' precipitation records begin in 1871. Surface-water data include continuous records of stage and discharge of streams. Location of 16 surface-water data sites are shown; included are 7 continuous-record stream-stage and discharge stations, and 4 staff-gage stream discharge sites. Streamflow records were collected as early as 1908. Groundwater data sites plotted on the map represent 40 wells where water levels have been measured periodically for 4 or more years or monthly for at least 1 year, and 49 wells from which water samples have been analyzed for dissolved-chemical constituents. (Woodard-USGS)
W76-00669

HYDROLOGIC UNIT MAP--1974, STATE OF NORTH CAROLINA.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.25. Hydrologic Unit Map of North Carolina, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *North Carolina, Water resources, Data collections, Planning, Hydrologic systems, Regions.
Identifiers: *Hydrologic unit maps(NC), *Hydrologic boundaries, Subregional boundaries, Accounting unit boundaries, Cataloging unit boundaries.

This map and accompanying table show Hydrologic Units in North Carolina that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregated of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-00670

HYDROLOGIC UNIT MAP--1974, STATE OF FLORIDA.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.25. Hydrologic Unit Map of Florida, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Florida, Water resources, Data collections, Planning, Hydrologic systems, Regions.
Identifiers: *Hydrologic unit maps(Fla), *Hydrologic boundaries, Subregional boundaries, Accounting unit boundaries, Cataloging unit boundaries.

This map and accompanying table show Hydrologic Units in Florida that are basically hydrologic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Resions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-00671

STORM WATER MANAGEMENT MODEL: DISSEMINATION AND USER ASSISTANCE,
University City Science Center, Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W76-00678

ADVANCED AUTOMATIC CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE TREATMENT PROCESS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-00693

URBAN STORMWATER MANAGEMENT MODELING AND DECISION-MAKING,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W76-00695

THE VALUE OF VEGETATION FOR CONSERVATION I. FOUR LAND AREAS IN BRITAIN,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
For primary bibliographic entry see Field 2I.
W76-00736

THE VALUE OF VEGETATION FOR CO VATION II. M1 MOTORWAY AREA.
Nature Conservancy, Grange-over (England). Merlewood Research Station
For primary bibliographic entry see Field 2I.
W76-00737

SCALE-UP AND PROCESS D TECHNIQUES FOR FIXED FILM BIOLO REACTIONS.
Quirk, Lawler and Matusky, New York
For primary bibliographic entry see Field 5D.
W76-00788

MODELS FOR GROUNDWATER ANALYS
Harvard Univ., Cambridge, Mass
For primary bibliographic entry see Field 4B.
W76-00816

SOME ASPECTS OF GROUNDWATE PLOITATION AND THE USE OF GR WATER MODEL IN THE MIRES BAS CRETE, GREECE.
For primary bibliographic entry see Field 4B.
W76-00820

EVALUATION OF SURFACE W RESOURCES FROM MACHINE-PROCE OF ERTS MULTISPECTRAL DATA,
Indiana State Univ., Terre Haute. Dept. of raphy and Geology.
For primary bibliographic entry see Field 5G.
W76-00833

GROUND-WATER LEVELS, 1968-1972,
Oregon State Engineer's Office, Salem.
W. S. Bartholomew, M. E. Graham, and J. Feusner.
Ground Water Report 18, November 1973. 16 fig, 49 ref.

Descriptors: *Groundwater, *Water *Hydrographs, *Oregon, Water wells, Aq Water resources, Groundwater reso Hydrologic cycle, Groundwater rec Groundwater movement, Water pol Management, Water management(Applied), collections.

The activities of the Ground Water Division the Oregon State Engineer were reviewed critical groundwater areas were describe these areas, expanding groundwater explo and an increasing number of wells has resu the over-development of groundwater rese Groundwater flow systems were desc Several well hydrographs in each of 28 g water areas of Oregon were presented. A lis observation wells was provided. (Sims-ISWS
W76-00887

SUMMARY OF GROUND WATER QUALI THE LOS ANGELES DRAINAGE PROVIN
California Dept. of Water Resources, Lo geles. Southern District.
G. H. Nishimura, R. Baldridge, P. Tiffany, a G. Arce.
District Report, November 1973. 173 p, 60 tab, 2 ref, 2 append.

Descriptors: *Groundwater, *Water qu *California, *Water chemistry, Data collec Dissolved solids, Chlorides, Sulfates, Nit Fluorides, Boron, Hardness(Water), Che analysis, Wells, Groundwater reso Aquifers, Histograms.
Identifiers: *Los Angeles Drainage Province.

ndwater quality data for the Los Angeles age Province were presented in tables and s. Statistics for chemical and other parame- ere tabulated by hydrologic subunit and sub- Histograms depicted the frequency distribu- f available data and of total dissolved solids), chloride, sulfate, nitrate, fluoride, boron, otal hardness concentrations. The histograms also presented for each subunit and subarea basin. (Sims-ISWS)
00888

E OF SYNTHETIC TIME SERIES IN ROMETEOROLOGICAL DATA ANALY-

al and Southern Florida Flood Control Dis- West Palm Beach.
rimary bibliographic entry see Field 2A.
00891

NGINEERING WORKS

Structures

UND WATER POLLUTION FROM SUB- ACE EXCAVATIONS, PART X, SEWER AGE.
onmental Protection Agency, Washington,

rimary bibliographic entry see Field 5B.
00527

ELING MAKES RIVERSIDE INTERCEP- FEASIBLE,
and Veatch, Kansas City, Mo.
imary bibliographic entry see Field 5D.
00778

ER USED TO SPEED SEWER TUNNEL TRUCTION.
imary bibliographic entry see Field 5D.
00780

ACTERISTICS AND COUNTERMEA- S AGAINST URBAN RIVER FLOODS HI KASEN NO SUIGAI NO TOKUSEI TO AKU),
imary bibliographic entry see Field 4A.
00805

BORATORY TEST OF SOME DRAIN FILTER MATERIALS,
l Univ., Montreal (Quebec).
imary bibliographic entry see Field 8G.
00832

AL REPORT 1974.
South Wales Univ., Kensington(Australia). Research Lab.
imary bibliographic entry see Field 9C.
00883

C ISLAND...TEN YEARS AFTER,
Collins and Associates Ltd., Honolulu, i.
lance, and P. M. Hirota.
and Beach, Vol. 42, No. 2, p 19-22, October fig, 8 ref.

ptors: *Islands, *Waves(Water), *Beaches, on, *Breakwaters, *Circulation, *Hawaii, ns, Sea walls, Construction, Design criteria, mance.
iers: *Peninsula, *Magic Island, *Swells, .

itial plan for constructing an island on the le reef in front of Honolulu's Ala Moana Park, and the work already performed were described. Only Ala Wai peninsula, a rubble mound breakwater fronting it, and two artificial beaches were completed. Environmental and public opposition halted the project and the island, called 'Magic Island' was not constructed. A detailed discussion was presented of the design criteria used for breakwater structures, considering wave run-up, wave heights and periods, slopes of the breakwater, and sizes of the stones used in the breakwater. The performance of the breakwater in the last 10 years was also explored. Overtopping of the breakwaters due to unusual smoothness of the breakwater front slope and subsequent erosion on the east side of the lagoon were reported. Presence of wind wave erosion was also noted on the west end of the lagoon beach. Parts of the lagoon beach have stablized on a slope of about 1:10. Despite these problems, the lagoon beach, seawall, and breakwater continue to function essentially as they were intended. (Bhowmik-ISWS)
W76-00889

MAINTENANCE OF TARRYTOWN HARBOR, NEW YORK, NAVIGATION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
Available from the National Technical Information Service, Springfield, Va 22161, as EIS-NY-73-1829-F, $4.00 in paper copy, $2.25 in microfiche. November 26, 1973. 43 p, 2 fig, 1 tab.

Descriptors: *Benthic fauna, *Dredging, *Channel improvement, *Channels, *Dimensions, Depth, Turbidity, Environmental effects, New York, Water quality.
Identifiers: *Environmental Impact statements, *Tarrytown, N.Y.

The project involves a maintenance activity consisting of dredging the existing federal navigation channel in Tarrytown Harbor, New York, to its authorized project dimensions. The spoil will be deposited in the Atlantic Ocean. Implementation will facilitate effectual and safe delivery by water of petroleum products and automobile parts to a densely populated region. The dredging will affect water quality and cause temporary turbidity. Benthic life will also be affected through the removal of bottom materials. Alternatives considered include alternative methods of spoil disposal or no maintenance. (Denvir-Florida)
W76-00940

FLOOD CONTROL ON SAGINAW RIVER, MICHIGAN AND TRIBUTARIES, FLINT RIVER AT FLINT, SWARTZ AND THREAD CREEKS, SECTIONS C-1 AND D, MICHIGAN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-MI-73-0523-F, $6.00 paper copy, $2.25 microfiche. March 1973, 150 p, 33 fig, 6 plat.

Descriptors: *Flood control, *Flood protection, *Channel improvement, Flood stages, Stream flow, Michigan, Environmental effects, Floods, Trees, Brush, Streams, Channels, Flooding, Storage, Tributaries, Water quality.
Identifiers: *Environmental impact statements, *Flint River, Michigan, Contiguous zone.

The project involves Flint River, Michigan, flood control improvements authorized by the Flood Control Act of 1958. The project consists of channel realignments and modification of 11,000 feet of the main stem of the Flint River and 8,900 feet of its tributaries. The program contemplates construction of a concrete-lined channel and concrete floodwalls for the river and an improved earth channel with raised levels along certain sections of the tributaries. The completed project will provide flood protection for approximately 455 acres of land adjacent to the Flint River and its tributaries. This area, subject to periodic flooding, includes a concentrated industrial complex. The proposed action would have an adverse environmental impact upon the existing stream channesl and the immediate, contiguous areas by displacing biological communities through the excavations and the construction of the concrete channel. The flood protection plan would remove trees and brush along the creek, and also reduce park space through channel enlargements. Alternatives to the proposed action include reduction of the flood stage design; reliance on non-structural techniques; utilization of upstream storage sites to reduce flood stages at the Flint problem areas; and discontinuance of the project. (Gagliardi-Florida)
W76-00941

REPLACEMENT OF LOCK AND DAM 7 AND LOCK 8, MONONGAHELA RIVER PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-PA-73-1694-F, $3.50 in paper copy, $2.25 in microfiche. October 1973, 19 p, 3 map.

Descriptors: *Environmental effects, *Navigation, *Dam construction, *Locks, Dams, Pennsylvania, Rivers, Navigable rivers, Navigable waters, Water utilization, Water users, Dredging, Construction, Turbidity, Sediments, Sediment distribution.
Identifiers: *Environmental impact statements, *Fayette and Greene Counties(Pa), Dam effects.

The project involves the complete replacement of existing river navigation facilities at Lock and Dam 7 and Lock 8, Monongahela River, Fayette and Green Counties, Pennsylvania. The improvement of navigation facilities will provide measures and incentives for continuation of growth in development and expansion of waterway user industries. An environmental effect of the project will be a pool level increase of 15 feet, extending 2.8 miles from river mile 82.2 to 85.0. It is predicted that the primary adverse environmental impact will be related to construction activities resulting in increase turbidity and sediment deposits for a relatively short river reach downstream of the project facility. Alternatives suggested include: replacement of Lock and Dam 7 at locations other than the site chosen, changes in the level of pool, or no action at all. Comments have been received from the United States Bureau of Sports Fisheries and Wildlife and Federal Water Quality Administration and from Pennsylvania's Department of Environmental Resources. (Gagliardi-Florida)
W76-00943

COLUMBIA AND LOWER WILLAMETTE RIVERS BELOW VANCOUVER, WASHINGTON AND PORTLAND, OREGON, SLAUGHTERS BAR REACH (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-OR-73-1123-F $5.00 in paper copy, $2.25 in microfiche. December 15, 1972, 82 p, 12 fig.

Descriptors: *Channel improvement, *Basins, *Dredging, *Columbia River, Spoil banks, Environmental effects, Environment, Navigation, Channels, Rivers, Sediments, Habitats, Turbidity, Disposal, Fish, Wildlife habitats, Shoals, Washington, Oregon.
Identifiers: *Environmental impact statements, *Portland(Ore).

The project involves plans to continue construction of a 40-foot-deep by 600-foot-wide navigation channel at Slaughters Bar, and a 40-foot-deep by 1200-foot-wide, turning basin above the Longview Bridge. The project also entails plans to dispose of

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dredge material on Cord Island, Oregon and Washington shores, with maintenance spoils being placed on Howard Island and the Oregon shore. The primary environmental impact of the project will be removal from the Columbia River of approximately 3.6 million cubic yards initially and 450,000 cubic yards annually of river bottom sediments. The adverse environmental effects will entail temporary increases in turbidity adjacent to and downstream of disposal areas and the temporary elimination of some wildlife and fish habitat. The secondary impacts associated with future industrialization will reduce and/or eliminate wildlife habitat on parts of the Oregon shore disposal area. Alternative proposal include: alternative plans for providing authorized channel and turning basin dimensions with provisions for reducing shoaling in the Slaughters Bar Reach; alternative disposal sites and uses of dredged materials; and no action. (Gagliardi-Florida)
W76-00944

PERMITS FOR ACTIVITIES IN NAVIGABLE WATERS OR OCEAN WATERS.
Federal Register, Vol 40, No 88, p 19766-19798, May 6, 1975.

Descriptors: *Dredging, *Permits, *Navigable waters, *Landfills, *Non-navigable waters, *Rivers and Harbors Act, Administration, United States, Legislation, Regulation, Administrative agencies, Artificial water courses, District of Columbia, Drainage, Erosion, Elevation, Swamps, Coastal plains, Coastal marshes, Inland waterways, Land forming, Mixing, Disposal, Specifications, Adoption of practices.
Identifiers: *Army Corps of Engineers, Disposal areas, Mixing zone, Administrative regulations.

Pursuant to the order of the U.S. District Court for the District of Columbia in NRDC v. Callaway, Civil Action No. 74-1242 (D. C. D. C. March 27, 1975), The Secretary of the Army herein proposes certain regulations to supersede those in 33CFR 209.120. All of the proposed changes pertain to the disposal of the dredged or fill material in water, or on land if the material might be worked back into water. They govern the procedures to be followed by the Corps of Engineers in requiring a Department of the Army permit for the water disposal of dredged material in every body of natural and artificial water in the U.S., and limting the types of waters for which a permit for dredging activities would be required. Public comment is invited on four different alternative regulations proposed. Appendices to the proposed rules include a statement of coordination and cooperation between the Secretaries of the Army and the Interior in regulating dredging activities, and guidelines for the delegation of authority in the issuing of permits. Proposed Part 230 covers other dredging related topics such as evaluation procedures, testing requirements, requirements for disposal sites, contaminated fill restrictions, and rules for the recording of disposal sites. (Parrish-Florida)
W76-00945

BLOUNT ISLAND DEVELOPMENT, JACKSONVILLE, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-FL-73-1292-F, $12.75 in paper copy, $2.25 in microfiche. August 3, 1973, 511 p.

Descriptors: *Bulkheads, *Dredging, *Industrial plants, Turbidity, Disposal, Weirs, Embankments, Grading, Environmental effects, Florida, Dikes, Road banks, Industries, Industrial production, Rivers.
Identifiers: *Environmental Impact Statements, *Jacksville(Fla).

The proposed action would authorize construction of a bulkhead and dredging operation in the St. Johns and Back River, Florida; placement of fill on upland and Back River sites; and grading and related operations in the vicinity of Blount Island. The purpose of the dredge and fill is to modify 950 acres of Blount Island, including 275 acres of Back River, for industrial development. Potential environmental impacts associated with the project are considered to be minimal. The impact on the surrounding community of an increase of 10,000 to 12,000 additional jobs resulting from the facility will be gradual. An adverse environmental effect will be the loss of whatever present and future contribution the 275 acres of Back River has to the total biological productivity of the St. Johns River Biologists are in disagreement as to the magnitude and significance of that loss. There will also be a temporary increase in turbidity in the waters of the St. Johns River in the local vicinity of the dredging and disposal operations. The planned use and maintenance of weirs, dikes, and containment booms will limit the degree and extent of that increase. The alternatives to the proposed action are to maintain the status quo and select a different site for the proposed facility; rezone the area to preserve the remainder of Blount Island; or utilize the remainder of Blount Island for continued fill placement and preserve Back River and its tidally inundated marsh fringes. (Gagliardi-Florida)
W76-00957

MARBLE BLUFF DAM AND PYRAMID LAKE FISHWAY, WASHOE PROJECT, NEVADA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Sacramento, Calif. Mid-Pacific Regional Office.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-NV-73-1585-F, $5.00 in paper copy, $2.25 in microfiche. October 4, 1973, 78 p, 6 fig.

Descriptors: *Dams, *Fisheries, *Erosion, Environmental effects, Nevada, Erosion control, Dam construction, Dam design, Fish, Fish management, Channels, Farms, Hatching, Recreation, Recreation demand.
Identifiers: *Pyramid Lake Indian Reservation, Nevada, *Environmental Impact Statements, Wilderness areas.

The project entails the construction and operation of a dam, fishway and related fish handling facilities near the terminus of the Truckee River in the Pyramid Lake Indian Reservation in Nevada. The dam will reduce river headcutting in the channel area preventing continued and extensive erosion of adjacent farmlands. The project's chief beneficial environmental impact will be the improvement of Pyramid Lake as a fishery and the preservation of Indian agricultural lands and homesites along the lower Truckee River. Construction roads, supporting structures and yards, noise and dust will have temporary adverse effects. Marble Bluff Dam and associated structures will intrude on the level, barren landscape. However, the structures are not large nor unharmonious with the surroundings. Disturbance of the natural setting should therefore be moderate. Improvement of the fishery will bring about increased recreational usage of the lake and adjacent shore areas. Possible alternatives include fishery restoration by hatchery production, a river channel modification in lieu of the proposed dam, and construction at an upstream damsite. Comments have been received from the Departments of Interior, Army, Agriculture, and Commerce among others. (Gagliardi-Florida)
W76-00958

GAS HOUSE COVE (EAST HARBOR FACILITY), SAN FRANCISCO MARINA SMALL CRAFT HARBOR, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineers District, San Francisco, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-CA-73-1817-F, $4.00 in paper copy, $2.25 in microfic
November 20, 1973, 41 p, 3 fig

Descriptors: *Groins(Structures), *Waves(Wat
*Breakwaters, *Ocean waves, Boats, Boat
Marinas, Construction, Construction materi
Concrete construction, Concrete structu
Seashores, Oceans
Identifiers: *Environmental Impact Stateme
*San Francisco(Calif)

Gas House Cove is located on the north shor
the City of San Francisco, one and one-half m
east of the Golden Gate Bridge. Along with
West Harbor, Gas House Cove forms wha
called the San Francisco Small Boat Harb
Shortly after it was built it became apparent th
was subject to excessive wave action and resul
damage. This project modifies the facility
reduce wave activity. Implementation will have
adverse ecological effects. The proposed bre
water will serve as a substrata for many marine
ganisms that are unable to live in bottom m
During construction precautions will be taker
prevent degradation of water quality. Alternati
considered include construction of a 176 f
concrete breakwater, or no action. (Den
Florida)
W76-00959

**NAVIGATION OF THE KANSAS RIVE
LAWRENCE TO THE MOUTH (FINAL E
VIRONMENTAL IMPACT STATEMENT).**
Army Engineer District, Kansas City, Mo.
Available from National Technical Informat
Service, Springfield, Va, 22161, as EIS-KS-
1560-F, $4.50 in paper copy, $2.25 in microfic
September 28, 1973. 52 p, 1 map.

Descriptors: *Dredging, *Channels, *Channel
provement, *Channel flow, Low flow, Constr
tion, Maintenance, River flow, River train
Rivers, Benthic fauna, Kansas, Missouri.
Identifiers: *Environmental Impact Statemer
*Kansas City(Mo).

The plan consists of a navigation project from
Missouri River to the Turner Bridge on the Kan
River requiring a channel width of 150 feet an
minimum channel depth of 9 feet. Initial constr
tion would include training and bank stabilizat
work at critical locations, and dredging in so
areas to establish a low flow channel. Maintena
dredging would be required on the average of o
every two years after project completion. Pot
tial adverse environmental impacts inclu
destruction of benthic organisms in the areas
dredging, disposition of spoil temporarily disru
ing fisheries and increased potential for acciden
spills associated with commercial navigati
Completion of the project will encourage m
rapid industrial development, and improve acc
sibility to the Kansas River. Alternatives studi
included varying lengths of river, construction o
pipeline, increased flow from lakes, dredging on
and regulation by dikes and revetments. (Den
Florida)
W76-00960

**LAKE BLUFF BEACH EROSION CONTRO
ILLINOIS (FINAL ENVIRONMENTAL IMPA
STATEMENT).**
Army Engineer District, Chicago, Ill.
Available from National Technical Informati
Service, Springfield Va 22161 as EIS-IL-73-02
F. December 1972. 113 p, 3 fig, 1 tab.

Descriptors: *Groins(Structures), *Erosion co
trol, *Sands, *Lake Michigan, Illinois, Constr
tion, Steel structures, Beach erosion, Beach
Piles, Foundations, Littoral drift, Erosion, E
sion rates.
Identifiers: *Environmental Impact Statemen
*Lake Bluff Beach, Sunrise Park, Lake Cou
ty(Ill).

posed improvement provides for the con-
on of two steel sheet piling impermeable
and the placement of 10,000 cubic yards of
ill in Lake Michigan on the north side of the
rnmost groin. Its purpose is to prevent
r erosion and to restore the eroded beach at
e Park in Lake, Bluff, Lake County, Illinois.
nprovement will assist in preventing a con-
degradation and loss of beach and the bluffs
oking the lake. The groin will cause a
ning of the beach profile lakewards. To the
the littoral drift is modified the increased
tion will affect the adjacent and downdrift
The amount of beach material presently
hing and maintaining the downdrift shore
reduced. Alternatives considered consist of
mental erosion control in conjunction with
an, or no action. (Denvir-Florida)
0962

FICIAL ISLANDS: POSSIBILITIES AND
L PROBLEMS,
Carolina State Univ., Raleigh.
imary bibliographic entry see Field 6E.
0965

NVILLE HARBOR, MISSISSIPPI (FINAL
RONMENTAL IMPACT STATEMENT).
Engineer District, Vicksburg, Miss.
ble from the National Technical Informa-
ervice, Springfield Va 22161 as EIS-MS-73-
. $4.00 in paper copy and $2.25 in
iche. September 10, 1973. 49 p.

ptors: *Harbors, *Channel improvement,
ging, Turbidity, Navigation, Environmental
, Mississippi, Industrial production, Chan-
Environmental control, Environment,
mics.
iers: *Environmental impact statement,
nville Harbor(Miss).

mended Greenville Harbor, Mississippi im-
nents involve a widening of the channel,
uction of an inner harbor channel into the
leveloped lands adjacent to the existing port
provision for a general use fleeting area and
g area in the first reach of the inner harbor
el, and spoilage of the dredged material to
e 390 acres of raised landfill. The harbor and
rea expansion would contribute to the
nic growth and development of the vicinity.
cant alteration of environmental elements,
ng land and water areas, would not result
roject implementation. However, land and
distrubance during project construction
create unsightly conditions and temporarily
fy turbidity and siltation levels in adjacent
. Navigation and industrial expansion would
bject the general area to additional sources
ution. The primary alternatives to project
nentation are different sites for harbor ex-
n, alternative modes of transportation, or
on. (Gagliardi-Florida)
0971

GETOWN CREEK WATERSHED PRO-
BEAR LAKE COUNTY, IDAHO (FINAL
ONMENTAL IMPACT STATEMENT).
nservation Service, Boise, Idaho.
ble from the National Technical Informa-
ervice, Springfield Va 22161 as EIS-ID-73-
. $4.50 in paper copy and $2.25 in
iche. February 1973. 68 p, 9 fig, 3 tab.

ptors: *Channel improvement, *Irrigation
s, *Watershed management, *Flood protec-
aho, Flood control, Sediments, Land
pment, Floods, Erosion, Channels, Irriga-
nvironmental effects, Water quality, Water
, Economic impact, Fish, Reservoirs,
storage, Fisheries.
iers: *Environmental Impact Statements,
getown Creek Watershed, Bear Lake Coun-

The proposed project entails land treatment measures, channel work, and improvements to the irrigation distribution system of the Georgetown Creek Watershed, Bear Lake County, Idaho. The project will provide waterhsed protection, flood prevention, and facilitation of irrigation. The environmental impact and effects of the project include erosion; floodwater and sediment damage reduction; improvement of water quality; elimination of various health hazards; stimulation of improved economic return; and a temporary loss of fish habitat and a decline of water quality due to construction activities. Alternatives considered include utilization of reservoirs for water storage and control; modification of the proposed works to provide a minimum flow of five cubic feet per second to maintain a fishery between the existing and proposed points of diversion or no action. (Gagliardi-Florida)
W76-00972

HAYS, KANSAS, FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
Available from the National Technical Information Service, Springfield Va 22161 as EIS-KS-73-0762-F $4.50 in paper copy and $2.25 in microfiche. November 1972. 63 p, 16 fig, 5 tab.

Descriptors: *Levees, *Channels, *Flood protection, *Flood control, Flood plain zoning, Environmental effects, Habitats, Biota, Kansas, Flood plains, Fisheries.
Identifiers: *Environmental Impact Statements, *Hays(Kan).

The recommended plan consists of new levees, raising of existing levees, and some channel work to provide protection from 76 percent of the standard project flood on Big Creek, Hays, Kansas. The project will provide flood protection to the already existing development in the flood plain, but it will destroy the existing channel and stream habitat to some extent. This includes the loss of associated stream biota that, in large part, supports its existing fishery. The project will also disrupt the existing character of the park. Alternatives to the proposed action include flood plain evacuation and zoning, flood control lake, or no action. Other alternatives considered related to utilization of Lincoln Draw, another channel. (Denvir-Florida)
W76-00973

CHIPOLA NURSERIES, INC. V. DIVISION OF ADMINISTRATION, DEPARTMENT OF TRANSPORTATION (APPEAL OF EMINENT DOMAIN PROCEEDING FOR VIOLATION OF NEPA).
For primary bibliographic entry see Field 6A.
W76-00979

8B. Hydraulics

SHEAR DISTRIBUTION IN BENDS IN RECTANGULAR CHANNELS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
D. V. Varshney, and R. J. Garde.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY8, Paper 11513, p 1053-1066, August 1975. 7 fig, 2 tab, 6 ref, 2 append.

Descriptors: *Open channel flow, *Laboratory tests, *Shear stress, Flumes, Velocity, Reynolds number, Continuity equation, Analysis, Distribution patterns, Hydraulics, Curves, Flow resistance, Roughness(Hydraulic).
Identifiers: *Bends, Secondary flow.

The analysis was based on a forced vortex velocity distribution near the exit of the bend. The constant is the assumed mean velocity distribution was evaluated by use of the continuity equation and by assuming that the entire superelevation had died out at the exit section. The exponent on the radius in the velocity distribution equation was correlated with the bend geometry and the Reynolds number. The mean velocity relationship suggested by Keulegan was assumed to be valid for flow in a bend. Experimental data, collected in a bend in a rectangular flume, were used along with other data to obtain information on the velocity variation. The flume bend had a 60 degree central angle. Three bed roughnesses were used. The bend radius to flume width ratio varied between 1.5 and 6.0. Bed shear stresses were measured in the bend with a preston tube calibrated for each bed roughness. (Adams-ISWS)
W76-00552

OPTIMAL SIZING OF URBAN FLOOD-CONTROL SYSTEMS,
Hydrologic Engineering Center, Davis, Calif. Planning Analysis Branch.
For primary bibliographic entry see Field 4A.
W76-00554

AQUIFER PARAMETER IDENTIFICATION,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 2F.
W76-00650

SCREEN THEORY FOR WELLS AND SOIL DRAINPIPES,
Iowa State Univ., Ames. Dept. of Agronomy.
M. Sami Selim, and D. Kirkham.
Water Resources Research, Vol 10, No 5, p 1019-1030, October, 1974. 19 fig, 3 tab, 19 ref.

Descriptors: *Well screen, *Wells, Theoretical analysis, Hydraulic design, Hydraulic equipment, Hydraulic properties, Irrigation wells.
Identifiers: *Screen theory.

A theoretical solution is given for steady flow in a confined aquifer to a well tube having equally distributed screens. It is shown, quantitatively, by use of Darcy's law and Laplace's equation, that more flow results if a given total length of well screen is utilized in a number of sections over the full length of the well tube than if the given length of well screen is all used at the bottom of the tube. For a pumped well of 0.25-ft radius, 200-ft radius of influence, 50-ft thickness of aquifer, and 25-ft length of screen the use of the screen in five 5-ft-long sections equally distributed over the well tube results in 25% more well flow than if the 25-ft length of screen is all in one piece at the lower 25 ft of the aquifer. The results are presented in tables and graphs having dimensionless parameters so that the flow for a particular flow system may be found in any units. Mathematically, the problem is of the mixed boundary value type. (Skogerboe-Colorado State)
W76-00734

WASTEWATER TREATMENT IN A PRESSURE PIPE,
Irvine Ranch Water District, Calif.
For primary bibliographic entry see Field 5D.
W76-00785

NOMOGRAMS FOR SEARCH OF SYMBOLS PU AND TU OF STORM OVERFLOW IN A MIXING CONDUIT (NOMOGRAMME ZUR EMITTLUNG VON PU UND TU EINES RECENUEBERLAUFS DES MISCHWASSERKANALS),
For primary bibliographic entry see Field 5D.
W76-00793

SEWER OVERFLOW - EVALUATION OF MODEL TEST AND USE IN SEWER TECHNIQUE (REGENUEBERLAEUFE - EINE

LIBRARY U. OF I. URBANA-CHAMPAIGN

AUSWERTUNG VON MODELLVERSUCHEN MIT ANWENDUNG AUF DIE KANALISATIONSTECHNIK),
For primary bibliographic entry see Field 5D.
W76-00794

TECHNICAL, ECONOMIC AND ORGANISATIONAL ASPECTS OF THE EXPLOITATION OF GROUNDWATER RESOURCES,
Gaudalquivir Project, Madrid (Spain).
For primary bibliographic entry see Field 4B.
W76-00811

PIPE SIZE SELECTION FOR COMMUNITY IRRIGATION SYSTEMS,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-00839

ANNUAL REPORT 1974.
New South Wales Univ., Kensington(Australia). Water Research Lab.
For primary bibliographic entry see Field 9C.
W76-00883

JET DISCHARGE INTO A STRATIFIED RESERVOIR,
San Jose State Univ., Calif. Dept. of Mechanical Engineering.
R. B. Darden, J., Imberger, and H. B. Fischer.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 101, No. HY9, Proceedings Paper 11583, p 1211-1220, September 1975. 9 fig, 2 tab, 10 ref, 2 append. NSF GI 34932, EPA 15040 EJZ.

Descriptors: *Jets, *Stratified flow, *Thermal stratification, *Unsteady flow, *Flow profiles, Hydraulics, Reservoirs, Density, Dispersion, Laboratory tests, Circulation, Discharge(Water), Buoyancy.
Identifiers: Streamline patterns.

An experimental investigation of the flow induced by a line jet in a linear-density stratified reservoir fluid was conducted. Both buoyant and non-buoyant jets were discharged into the stratified model and jet discharge and model length were varied. Experimental data indicated the two-dimensional flow field could be divided into three regions: (1) open region above equilibrium level, (2) closed region below equilibrium level, and (3) a central jet with adjacent entrainment rotors. True steady state flow was not achieved. The pattern of induced flow showed no distinctive changes when model length or jet discharge were varied, but the induced flow pattern showed appreciable changes when jet buoyancy was varied from neutral to buoyant. Maximum flow speed, rotor size, and entrainment were significantly increased for the buoyant jet. (Adams - ISWS)
W76-00911

8C. Hydraulic Machinery

STREAM POLLUTION ABATEMENT BY SUPPLEMENTAL PUMPING,
Richmond City Dept. of Public Utilities.
For primary bibliographic entry see Field 5D.
W76-00509

THE SELECTION AND APPLICATION OF SLURRY PUMPS,
E. L. Arnold.
Pumps and Their Applications, The International Technical Review, No 105, p 763-967, June, 1975. 10 fig.

Descriptors: *Slurries, *Centrifugation, *Pumps, *Design criteria, Hydraulic engineering, Liquids, Construction materials, Waste water treatment.
Identifiers: Slurry pumps.

Basic facts concerning when to specify a slurry rated pump, which type of pump to use, and proper application of such pumps are reviewed. The centrifugal slurry pump may be used for municipal sewage, industrial wastes, and evaporator-crystalizer fluids, and should be considered when the fluid to be pumped contains more solids than are found in potable water. Choice of pump should be initially based on the liquids to be pumped in terms of physical and chemical characteristics. Other influences on the choice of pump include required heads and capacities, plant layout considerations, and economic requirements. Basic pump material is usually cast iron, sometimes reinforced with 3% nickel for corrosion protection. Also, materials such as rubber linings may be used for pump protection. The main working basis for pump selection is the System Curve. This is illustrated by several graphs and represents a plot of the head which must be met by the pump at any given series of capacity points, as determined by the piping. Thus, once the static nature of the slurry is known, and the plant requirements and manufacturer's specifications are stated, one can choose a slurry pump that meets design requirements and has performance curves, which when laid on the System Curve form an intersection at a point low enough to minimize wear. (Kramer-FIRL)
W76-00565

SWITCHING VALVE FOR CONTINUOUS FILTERING DEVICES,
Agfa-Gevaert, Mortsel (Belgium).
M. L. Beuselinck.
United States Patent 3,896,029. Issued July 22, 1975. Official Gazette of the United States Patent Office, Vol 936, No 4, p 1385-1386, July, 1975. 1 fig.

Descriptors: *Patents, *Flow, Liquids, Equipment, *Valves, Filtration, Water treatment, Waste water treatment, Conduits.

A flow control unit has been patented which selectively controls fluid flow from a common inlet conduit through two loop-shaped flow paths into a common outlet conduit. Each loop-shaped flow path includes a filtration unit. Control is achieved by a valve which has a supply inlet port connected to the inlet conduit and two loop inlet ports arranged in an angularly spaced relation about the axis of the valve housing. Part of the valve rotates within its housing and is in continuous communication with the common inlet conduit. Thus a wall is defined, larger in angular extent than either of the loop inlet ports, so that by rotating the valve either of the ports can be exclusively used to feed the flow of liquids. Flow may be through each loop discharge port alternatively or through both together. (Kramer-FIRL)
W76-00586

RECENT TRENDS OF INSTRUMENTATION, CONTROL, AND AUTOMATION SYSTEMS FOR WASTEWATER TREATMENT SYSTEMS (GESUIDO SHISUTEMU SEIGYO NO DOKO),
For primary bibliographic entry see Field 5D.
W76-00604

SPECIFICATIONS FOR GRANULAR FILTER MEDIA,
University Coll., London (England).
For primary bibliographic entry see Field 5D.
W76-00622

A HISTORY OF SEWAGE WORKS' MACHINERY,
For primary bibliographic entry see Field 5D.
W76-00639

PORT HURON FRESH WATER TUNNEL
Tunnels and Tunnelling, Vol 4, No 4, p 31
1972 1 fig

Descriptors *Tunnels, *Tunneling, Tunn
struction, Equipment, Michigan
Identifiers: Detroit(Mich), Tunneler

The Detroit Metropolitan Water Depar
Port Huron tunnel, an 18.3-foot diamete
tunnel with a foot-thick concrete lin
scheduled to carry 1 2 billion gallons of w
day. In this project, the hardrock t
designed and manufactured by the Lawren
sion of Ingersoll-Rand Company,
Washington, bored a record 2060 cubic y
shale in 19 hours. The 175-ton machine
steady heading as exemplified by the bore
being within 3 5 inches of true line and gra
the full length of the tunnel. This accuracy
tributed to the tunneler's pilot anchor loca
mediately behind a pilot drill which exte
feet ahead of the cutterhead and rotates at
imately 60 rpm while the cutterhead rotate
rpm. Working with the pilot anchor, whic
tached to a shaft running the full length of
neler thus forming the basic structural me
the machine, are rib jacks which thrust u
million pounds pressure against the tunn
(Sandoski-FIRL)
W76-00768

SURFACE SCUM EXTRACTOR-FOR RE
GULAR FLOTATION TANK IN SE
WORKS.
For primary bibliographic entry see Field 5
W76-00845

8D. Soil Mechanics

THE EFFECT OF FINITE CHANNEL
ON CONCENTRATION POLARIS
REVERSE OSMOSIS UNDER LAMINAR
CONDITIONS,
Birmingham Univ. (England). Dept. of C
Engineering.
For primary bibliographic entry see Field 3
W76-00642

SMALL TENSIOMETERS FOR FIELD
LABORATORY STUDIES,
Agricultural Research Service, Gainesville,
For primary bibliographic entry see Field 2
W76-00733

POWDERED METAL PLATES FOR
STRUCTING UNSATURATED FLOW CE
Agricultureal Research Service, Fresno,
Water Management Research.
For primary bibliographic entry see Field 2
W76-00840

8E. Rock Mechanics and Geology

MOLE MUNCHES THROUGH 4 MIL
HARD ROCK.
For primary bibliographic entry see Field 5
W76-00779

TUNNELLING METHOD BREAKS
GROUND.
For primary bibliographic entry see Field 8
W76-00781

. Materials

MPRESSIBILITY CHARACTERISTICS OF ISTURBED SNOW,
Regions Research and Engineering Lab. over, N.H.
primary bibliographic entry see Field 2C.
-00537

ROSION CONTROL BY CATHODIC PRO-TION,
primary bibliographic entry see Field 5D.
-00619

FLOATING COVER: BEST WAY TO ER A FINISHED-WATER RESERVOIR.
primary bibliographic entry see Field 5F.
-00624

RATION OF SEWER AND DRAINAGE TEMS (BETRIEB VON KANALISATIONS- ENTWAESSERUNGSANLAGEN),
primary bibliographic entry see Field 5D.
-00626

NG OF STORAGE RESERVOIRS AND OONS--THE LATEST TECHNIQUES IN IN-LLATION AND JOINTING,
ulson.
r Services, Vol 79, No 952, p 235-237, June, 4 fig, 2 tab.

riptors: *Synthetic rubber, Reservoirs, oons, Installation, *Joints(Connections), truction materials, *Linings.
ifiers: *Jointing, Butyl, EPDM, Hypalon, rvoir linings.

hetic rubber membranes for lining permanent voirs and lagoons have been used recently. e different rubber materials which can be effi-ly jointed and installed are Butyl, Hypalon, EPDM. All three must have been manufac- to correct specifications; must have been factorilly fabricated into large sheet sizes r factory-controlled conditions, using correct ing techniques for their particular product; nust have installation and site jointing carried by skilled and fully trained operators. Butyl EPDM are discussed in detail; in terms of hering, chemical properties, permeability, mechanical resistance, these materials are g and long-lasting. In order to construct a turally sound reservoir, however, it is neces-to follow recommendations for the embank- and reservoir base. The substrate must be th; efficient under-drainage systems must been built before addition of the membrane; precautionary measures must be taken if any bility of natural gas leakage exists. Both l and EPDM are factory-made in sheets and nized together by the use of heat pressure n uncured tape which is placed between the s before heat and pressure are applied. ts may be jointed on site, and must be erly anchored into a reservoir. Hypalon may upported or unsupported and is used in a -supported form to waterproof lagoons or voirs. Hypalon is the least affected by ozone ultraviolet light. (Kramer-FIRL)
00632

NESE LOADING TESTS ON BERNOLD NG SYSTEM.
els and Tunnelling, Vol 4, No 4, p 320, July, 3 fig.

riptors: Tunnels, Testing, Strength of materi-onstruction materials, Construction joints.
ifiers: Japan, Bearing capacity, Bernold s.

Loading tests to determine the influence of Bernold sheets on the bearing behavior of thin semi-stiff tunnel vaults with large spans have been conducted in Japan. The test piece is a concrete arch section 25 cm thick by 8 meters in length and reinforced by 2 mm-thick Bernold sheets. Under a distributed load of 2.7 tons/cubic meter, no cracks larger than .05 mm were determined. This compared with a broad flanged girder which ruptured under a load smaller than 20 tons/square meter. Results confirm that Bernold sheets have a very high bearing capacity and their joints do not cause any weakness in the structure. Sandoski-FIRL)
W76-00767

32-FOOT VERTICAL SHAFT BUILT WITH CONCRETE PIPE.
The American City, Vol 87, No 12, p 28, December, 1972. 2 fig.

Descriptors: Concrete pipes, Construction, Pipes, Sewers, Waste water treatment.

To avoid blocking a busy intersection, a vertical shaft and 75 feet of tunneling were used to connect two sewers with a 32-foot differential in elevation. The vertical shaft consisted of 36-inch concrete pressure pipes with tees at the upper and lower end. A special reducer connects the 36-inch pipe to the 48-inch tee at the lower end. This tee at the base of the shaft permits a slight buildup of water that serves as a liquid cushion at the bottom of the 32-foot drop. An eight-inch riser pipe connected to the vertical shaft at the ends and third point eliminates the possibility of a vacuum developing. The top of the shaft, capped with a concrete bulkhead plug, can be reached by means of a manhole extending to the street surface. (Sandoski-FIRL)
W76-00776

TUNNELLING METHOD BREAKS NEW GROUND.
Surveyor, Vol 140, No 4189, p 27, September 22, 1972. 2 fig.

Descriptors: *Tunneling, *Tunneling machines, *Tunnels, Soils, Sewers, Water supply, Safety, Costs, Bentonite.

A new method and equipment for tunneling difficult sand and gravel includes the introduction of bentonite to the basic method used in tunneling through soft ground with an excavator shield. The use of the new machine and technique eliminates or reduces the use of compressed air, which can cause bone necrosis in tunnel miners, and also reduces the risk of subsidence. With the tunneling machine, similar to other excavator shields designed for soft tunneling, the cutters revolve in a sealed chamber which is filled with a thixotropic slurry of bentonite clay under pressure. Bentonite holds up the tunnel face, sinking into the gravel for some inches and forming a skin to seal it. One tunnel ring at a time is built up from cast iron segments in the tail of the machine and the machine pushes itself forward by jacking against the completed ring. The development of this method will considerably reduce tunneling costs and also have an important of the building of underground railways as well as becoming applicable to tunnels for sewers, water supply, or electric cables. Tunnels can be constructed at relatively shallow depths below buildings or roads without danger according to present experience with the application of this technique. (Sandoski-FRIL)
W76-00781

OAKLAND MAPS PROGRAM TO COMBAT SEWER INFILTRATION,
California State Dept. of Public Works, Oakland.
For primary bibliographic entry see Field 5D.
W76-00792

SEWERAGE DRAINS MADE OF PLASTIC PIPES (KANALISATION MIT KUNSTSTOF-FROHREN),.
For primary bibliographic entry see Field 5D.
W76-00797

A LABORATORY TEST OF SOME DRAIN TUBE FILTER MATERIALS,
McGill Univ., Montreal (Quebec).
E. McKyes, and R. S. Broughton.
Canadian Agricultural Engineering, Vol 16, No 2, p 60-62, December, 1974. 5 fig, 6 ref.

Descriptors: *Drainage, *Drainage effects, *Drainage engineering, *Drainage practices, Filtration, Drains, Materials testing.

Drainage systems frequently fail in fine sandy soils because of particles entering drain tiles in sufficient quantity to block the drains. Attempts have been made to employ filters outside tiles to allow only soil-free water to enter the system. Some commercially available or promising filters for corrugated plastic drain tubes were tested and their effect on water and soil entry into tubes over approximately 2 mo of continuous operation was assessed. Compared with unfiltered tubes, those with polyester weave stocking filters and fiberglass showed very little soil entry and a good continued waterflow. (Skogerboe-Colorado State)
W76-00832

PIPELINE PIG OR SWIPE,
H. J. Girard.
Canadian Patent 994,109. Issued March 26, 1974. Patents/Brevets, Vol 102, No 13, p 1062, March 26, 1974.

Descriptors: *Patents, *Pipes, *Sewers, *Cleaning, Pipelines, Plastics.
Identifiers: Swipes, Pigs(Devices).

A patent has been issued for a pig or swipe for use in cleaning pipe lines and for maintaining fluids separated while being transmitted through the line. It is adapted to be propelled through the line by a pressure gradient. The pig includes a sponge-like body of foamed plastic material, having an external coating of durable material (unfoamed plastic) in which reenforcing material (wire mesh or glass fabric) may be embedded to increase resistance to wear. The covering is applied to leave openings through which the sponge-like body may project into wiping contact with the surroundings internal surface of the pipe. The pig also has a barrier layer at one end positioned to close the sponge-like body against the passage of fluid, and to form a fluid tight seal with the surrounding pipe. The invention includes a method and apparatus for making the pigs or swipes. (Murphy-FIRL)
W76-00848

LAKE BLUFF BEACH EROSION CONTROL, ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 8A.
W76-00962

8H. Rapid Excavation

PORT HURON FRESH WATER TUNNEL.
For primary bibliographic entry see Field 8C.
W76-00768

MINI TUNNELLING SYSTEM.
Gas World, Vol 176, No 4599, p 309, October 14, 1972. 3 fig.

Descriptors: *Tunnels, *Tunneling machines, Trenches, Pipes, Tunnel construction, Soil pressure.

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The Mini Tunnel is a complete fully integrated segment built tunneling system replacing sewer trenching in urban areas and accommodating pipes up to 48 inches in diameter. Using thin shell segments, built-in stress inducers keep the structure in compression to tolerate variable soil pressures. Aerohydraulics are used to move the shield through the ground as 120 degree concrete segments are built in the shield tail. Differential pressure steering produces accurate alignment control. The system is competitive with open trench sewer laying at shallow depths. The whole package, including a two-ton crane to handle materials, a tool compressor to drive the shield and gravel injector, and a Mini Mule for underground transportation, with a total weight of six tons, economizes on site-to-site haulage. (Sandoski-FIRL)
W76-00782

PERMIT APPLICATION BY RADCLIFF MATERIALS, INC. DREDGING OF DEAD-REEF SHELLS, MOBILE BAY, ALABAMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
February 1973. 198 p, 3 tab, 1 map.

Descriptors: *Dredging, *Oysters, *Bays, *Benthic fauna, Turbidity, Ecosystems, Environmental Effects, Alternative planning, Photosynthesis, Mud, Alabama.
Identifiers: *Environmental Impact Statement, *Mobile(Ala).

The project consists of dredging oyster shell from four areas within the confines of Mobile Bay, Alabama. The shell dredge will resuspend materials present in the bay bottom which have been isolated from the day-to-day bay ecosystem for a long period of time. Benthic organisms will be destroyed by the cutting of the dredge and smothered by the mud flow. Turbidity caused by the dredging will reduce photosynthesis slowing the repopulation of benthic organisms. Some dredging of small amounts of live oysters is unavoidable. There are three alternatives to the approval of the permit application: denial of the permit, issuance of the permit with conditions of non-renewal at its expiration, or issuance of the permit with restrictions. (Denvir-Florida)
W76-00961

8I. Fisheries Engineering

ACQUISITION AND CULTURE OF RESEARCH FISH: RAINBOW TROUT, FATHEAD MINNOWS, CHANNEL CATFISH, AND BLUEGILLS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
For primary bibliographic entry see Field 5G.
W76-00680

ARTIFICIAL ISLANDS: POSSIBILITIES AND LEGAL PROBLEMS,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 6E.
W76-00965

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

NERC 74, ANNUAL REPORT.
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-00879

ANNUAL REPORT 1974.
New South Wales Univ., Kensington(Australia) Water Research Lab
Water Research Laboratory, 1974. 9 p, 2 fig.

Descriptors: *Research and development, *Investigations, *Water resources, *Engineering, *Australia, Hydraulics, Model studies, Mathematical models, Computer models, On-site investigations, Surveys, Calibrations, Hydraulic engineering, Design, Planning, Groundwater, Estuaries, Coasts, Flow.

The Water Research Laboratory (WRL) is a section of the School of Civil Engineering of the University of New South Wales. Specializing in research, design, and investigation of water engineering problems, it is active in the areas of graduate instruction in hydraulics and water resources; basic research of water engineering problems; design, planning, and investigation of water engineering projects; co-ordination of multi-discipline projects in the development of water resources; hydraulic model studies; computer analysis and mathematical models; field surveys; calibration and testing of pumps and meters; and library services. During the 1974 basic research studies were undertaken in the fields of groundwater, coastal and estuarine hydraulics, multi-density flow, water resources, water supply, and open channel hydraulics. Brief descriptions of 57 research projects were given. (Robinson-ISWS)
W76-00883

9D. Grants, Contracts, and Research Act Allotments

NERC 74, ANNUAL REPORT.
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-00879

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY OF HYDROLOGY, CANADA, 1971-1973.
International Association of Hydrological Sciences, Ottawa (Ontario).
Department of the Environment, Ottawa, Ontario (Canada), Inland Waters Directorate.410 p.

Descriptors: *Hydrology, *Bibliographies, *Canada, Meteorology, Surface waters, Rivers, Lakes, Snow, Sedimentation, Groundwater, Soil moisture, Water quality, Water pollution, Data collections, Reviews, Information retrieval.

A bibliography of information relating to hydrology in Canada was compiled. References were listed in the areas of general hydrology, hydrometeorology, surface water, subsurface waste, bio-hydrology, forest hydrology, water quality, and pollution. An author index was provided. (Robinson-ISWS)
W76-00532

HYDROLOGY AND WATER RESOURCES, A SYLLABUS OF REFERENCES FOR TEACHING INTRODUCTORY COURSES IN THE WATER ENVIRONMENT.
National Committee for the International Hydrological Decade, Washington, D.C.
Available from the National Technical Information Service Springfield, Va 22161 as PB-238-071.
National Academy of Sciences-National Research Council, Washington, D.C., August 1972. 73 p. NSF-C-310.

Descriptors: *Education, *Bibliographies, *Publications, *Hydrology, *Water resources, Water, Water properties, Hydrologic cycle, Atmosphere, Groundwater, Soil moisture, Watersheds(Basins), Streamflow, Water utilization, Floods, Wetlands, Water pollution, Water Management, Decision making, Remote sensing, Technology, Research and development.
Identifiers: Syllabus.

This syllabus provides a detailed guide to teaching courses in general hydrology and water resources fields and offers a large number of references. Reflecting the current concern for both the science and management of water, it includes references to physical aspects of water and to economic, political, and social stresses placed on that physical system by the complex demands for water in the United States. The syllabus is outlined in sufficient detail to be capable of being used as a basis for a wide variety of instructional needs, ranging from a 2-hour lecture series to a full semester introductory courses in hydrology and water resources problems. The syllabus is in the form of an annotated topical outline. Each topic is subdivided to provide increasingly detailed information. An instructor should find an adequate selection of basic introductory material to meet needs. The bibliography of references includes 1,000 sources. (Robinson-ISWS)
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Energy Quality Interactions of Sunlight, Wa Fossil Fuel, and Land,
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Some Factors Influencing Groundwa Development and Use for Agriculture,
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FOOD AND AGRICULTURE ORGANIZATIO OF THE UNITED NATIONS, ROME (ITALY).
Groundwater Seminar, Granada.
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REST SERVICE (USDA), BERKELY, CALIF. CIFIC SOUTHWEST FOREST AND RANGE PERIMENT STATION.
Major Floods, Poor Land Use Delay Return of Sedimentation to Normal Rates,
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REST SERVICE (USDA), DURHAM, N.H. RTHEASTERN FOREST EXPERIMENT ATION.
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REST SERVICE (USDA), ODGEN, UTAH. TERMOUNTAIN FOREST AND RANGE PERIMENT STATION.
Water Potentials of Salsola Kali L. at Differing Levels of Substrate Water Availability,
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The Operation System of Urban Sewerage Treatment (Toshi gesuishorijo no opereshon shisutemu ni tsuite),
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Technical, Economic and Organisational Aspects of the Exploitation of Groundwater Resources,
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Hydrologic Data Network for the Oswego River Basin, New York,
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Ground-Water Basic Data for Grant and Sioux Counties, North Dakota,
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Potential of Madison Group and Associated Rocks to Supply Industrial Water Needs, Powder River Basin, Wyoming and Montana,
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The Surface Water Supply of the United States, 1966-70: Part 4. St. Lawrence River Basin--Volume 1. Basins of Streams Tributary to Lakes Superior, Michigan, and Huron,.
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Hydrologic Unit Map--1974, State of Florida.
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Citizen Enforcers: Influencing Water Resources Allocation Decisions,
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Studies on Floc-Forming Substances in Activated Sludge. II. Floc-Forming Action by the Viscous Substance Extracted from Activated Sludge by Alkaline Solution. (In Japanese),
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The Role of Groundwater in the Optimum Utilization of Water Resources,
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Automatic Scum Removal Trough,
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Models for Groundwater Analysis,
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Meander Irregularity and Wavelength Estimation,
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Optimal Sizing of Urban Flood-Control Systems,
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Nitrate Occurrence in Some Soils with and Without Natric Horizons,
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Water Resources of Hancock County with Emphasis on Ground-Water Availability,
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Evaluation of Surface Water Resources from Machine-Processing of ERTS Multispectral Data,
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Application of Systems Analysis Models to the Problem of Conjunctive Use of Surface and Groundwater in the Vega of Granada,
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Environmental Isotopic Study of the Barremian-Jurassic Aquifer in South Dobrogea (Roumania),
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INSTITUTUL DE STUDII SI CERCETARI PEDOLOGIE, BUCHAREST (RUMANIA).
Hydrosaline Regime of Some Soils in the Middle Part of the Calmatui River Basin. (In Rumanian),
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INTERNATIONAL ASSOCIATION OF HYDROLOGICAL SCIENCES, OTTAWA (ONTARIO).
Bibliography of Hydrology, Canada, 1971-1973.
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INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN, BETHESDA, MD.
The Potomac, 1974 Annual Report.
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Plant Nutrient Losses From Tile-Outlet Terraces,
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Wastewater Treatment in a Pressure Pipe,
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Development of Sewer Systems.
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Erosion in the Urban Environment,
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Estimating Indirect Cost of Urban Water Use,
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A Flexible Apparatus for Continuous Recording of Water Uptake by Plants,
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Void Changes in Allophane Soils Determining Water Retention and Transmission,
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Bacteriological Studies of Wicomico River Soft-Shell Clam (Mya Arenaria) Mortalities,
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MARYLAND UNIV., PRINCESS ANNE. DEPT. OF BIOLOGY.
Burying Behavior in Relation to Substrate and Temperature in the Hermit Crab, Pagurus Longicarpus,
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Fate of Trace Metals in Los Angeles County Wastewater Discharge,
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A Laboratory Test of Some Drain Tube Materials,
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Designing Water Treatment Plants at th Engineering Consulting Firm Mely (Viztisztitas tervezes a Melyepterv T Vallalatnae),
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METCALF AND EDDY, INC., BOSTON, M
Nitrification Rate in Biological Processes
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Rainfall-Runoff Relations on Urban and Areas,
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A Problem in the Use of Insecticides in Fields in West Malaysia: A Case Study,
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System for Exploitation of the 'Co Heritage of Mankind' at the Caracas ference,
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Flow Establishment and Initial Entrainm Heated Water Surface Jets,
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The Effect of Soil Crusts on Infiltration Effect of Aggregate Size and Depth of T on Steady Infiltration Through Crust-T Tilled Soils,
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MINNESOTA UNIV., ST. PAUL. DEPT. OF ENTOMOLOGY, FISHERIES AND WILDL
In Vitro Inhibition of Fish Brain Atpase A ty by Cyclodiene Insecticides and R Compounds,
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Hydrology for Engineers and Planners,
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Retardation of Condensation Nuclei Grow Surfactant,
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MONTANA STATE UNIV., BOZEMAN. DE OF ELECTRICAL ENGINEERING.
Application of Microwave Water Se Techniques to Watersheds,
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SE BOULGER, INC., FLUSHING, N.Y.
IGNEE).
enerator for Raw Sewage,
76-00580 5E

AI KOGYO KABUSHIKI KAISHA,
YO (JAPAN). (ASSIGNEE).
paratus for Dissolving Large Quantities of
ygen in Water,
76-00570 5D

IONAL BUREAU OF STANDARDS,
HINGTON, D. C., MECHANICS DIV.
rformance Characteristics of 'Bulk Effect'
midity Sensors,
76-00886 7B

IONAL CENTER FOR RESOURCE
OVERY, INC., WASHINGTON, D. C.
ecifications for Materials Recovered From
nicipal Refuse,
76-00684 5D

IONAL COMMITTEE FOR THE
RNATIONAL HYDROLOGICAL DECADE,
HINGTON, D.C.
drology and Water Resources, A Syllabus of
ferences for Teaching Introductory Courses
the Water Environment.
76-00536 10C

IONAL ENVIRONMENTAL RESEARCH
TER, CINCINNATI, OHIO.
rc 74, Annual Report.
76-00879 5G

IONAL ENVIRONMENTAL RESEARCH
TER, LAS VEGAS, NEV.
Situ Soil Gamma Analyzer--A New Ap-
ach to Determine the Movement of Pollu-
ts in Soils.
76-00912 5A

IONAL FERTILIZER DEVELOPMENT
TER, MUSCLE, ALA.
cretion and Dilution of Nutrients in Young
rn, as Affected by Yield Response to
trogen, Phosphorus, and Potassium,
76-00823 3C

IONAL GEOLOGY COMMISSION,
RID (SPAIN); AND GUADALQUIVIR
JECT, MADRID (SPAIN).
e Role of Groundwater in Spain,
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IONAL MARINE WATER QUALITY LAB.,
SINGTON, R. I.
xic, Sublethal, and Latent Effects of
troleum on Red Sea Macrofauna,
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IONAL OCEANIC AND ATMOSPHERIC
INISTRATION, ROCKVILLE, MD.
ernational Field Year for the Great Lakes.
76-00535 2H

IONAL RESEARCH COUNCIL,
HINGTON, D. C.
loride Pollution,
76-00975 5C

IONAL VEGETABLE RESEARCH
TION, WELLESBOURNE (ENGLAND).
Simulation Model for Prediction of Herbicide
rsistence,
76-00730 5B

NATIONAL WATER QUALITY LAB., DULUTH, MINN.
Mercury Residues in Fathead Minnows, Pimephales Promelas Rafinesque, Chronically Exposed to Methyl-Mercury in Water,
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NATURE CONSERVANCY, EDINBURGH (SCOTLAND).
Deep Water Waves in Lakes,
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Ground-Water Recharge Simulation,
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Annual Report 1974.
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Legal Measures Concerning Marine Pollution.
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Computation of Economic Data Concerning the Exploitation of Groundwater on a Regional Scale,
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Chloride Contamination in Alum Creek, Central Ohio.
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Prediction of Assimilation Capacity in Receiving Streams, Part I,
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Prediction of Assimilation Capacity in Receiving Streams, Part II,
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Ground-Water Levels, 1968-1972,
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The Theory of Wave Propagation in Water of Gradually Varing Depth and the Prediction of Breaker Type and Height,
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Phytoplankton and Eutrophication in Some Lakes in Vestfold, South Norway,
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Water and Energy Requirements in the Mining and Processing of Coal, Including Land Reclamation,
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Increasing Intensification of Plant Production and the Problem of Changes in the Natural Environment,
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Scale-up and Process Design Techniques for Fixed Film Biological Reactions,
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Dehydration of Urban Sewage Sludge by Freezing (Toshi gensui odei no toketsu dassui shori),
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Assessment and Development Plan for Monitoring of Organics in Storm Flows,
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Stream Pollution Abatement by Supplemental Pumping,
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Salt Water Intrusion into Porous Media,
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The 1973 Flood and Man's Constriction of the Mississippi River,
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Water Use as a Factor in Meeting Electric Power Needs,
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SAN JOSE STATE UNIV., CALIF. DEPT. OF MECHANICAL ENGINEERING.
Jet Discharge into a Stratified Reservoir,
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Demonstrated Technology and Research Needs for Reuse of Municipal Wastewater,
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Development of a Gross Pollution Detector: Laboratory Studies,
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A Continuous Gargantuan Task for Severn Trent,
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Choice Between Surface and Groundwater for Water Supplies to Urban Centres,
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SOIL CONSERVATION SERVICE, BOISE, IDAHO.
Georgetown Creek Watershed Project, Bear Lake County, Idaho (Final Environmental Impact Statement).
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Occurrence and Distribution of Potassium Ions in Natural Waters in India,
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Pipe Size Selection for Community Irrigation Systems,
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An Evaluation of Water Reuse for Municipal Supply,
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Toxicity of Nitrite to Channel Catfish,
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Disposal and Utilization of Waste Kiln From Cement Industry,
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SOUTHWESTERN STOCKHOLM REGION WATER AND SEWERAGE WORKS, INC. (SWEDEN).
Southwestern Stockholm Regional Trea System,
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Trace Metal Levels in Beach Dipteran Amphipods,
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STATE UNIV. OF NEW YORK AT SYRAC COLL. OF ENVIRONMENTAL SCIENCE FORESTRY.
Hydrograph Responses to Watershed Size and Similitude Relations,
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Stockholm Through the Eyes of the Sev Engineer,
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Forecasts of the Effects of Air and Wat lution Controls on Solid Waste Generatio
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- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

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Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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SUBJECT FIELDS AND GROUPS

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

GALERKIN FINITE-ELEMENT SIMULATION OF A GEOTHERMAL RESERVOIR,
Geological Survey, Reston, Va.
J. W. Mercer, Jr., and G. F. Pinder.
Geothermics (Italy), Vol 2, Nos 3 and 4, p 81-89, September-December, 1973. 11 fig, 10 ref.

Descriptors: *Geothermal studies, *Thermal water, *Steam, *Mathematical models, *Energy transfer, Porous media, Equations, Fluid mechanics, Thermodynamic behavior, Heat flow, Methodology.
Identifiers: *Geothermal systems, Geothermal reservoirs.

The equations describing fluid flow and enrgy transport in a porous medium can be used to formulate a mathematical model capable of simulating the transient response of a hot-water geothermal reservoir. The resulting equations can be solved accurately and efficiently using a numerical scheme which combines the finite element approach with the Galerkin method of approximation. Application of this numerical model to the Wairakei geothermal field demonstrates that hot-water geothermal fields can be simulated using numerical techniques currently available and under development. (Woodard-USGS)
W76-01179

IONIZATION OF WATER IN SEAWATER,
Oregon State Univ., Corvallis School of Oceanography.
C. H. Culberson, and R. M. Pytkowicz.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-002 106, $3.50 in paper copy, $2.25 in microfiche. Marine Chemistry, Vol 1, p 309-316, 1973. 3 tab, 19 ref. NR 083-102. ONR N00014-67-A-0369-0007.

Descriptors: *Ionization, *Sea water, *Salinity, *Chemical properties, *Hydrogen ion concentration, Ions, Chemical reactions, Saline water, Alkalis(Bases), Temperature, Physical properties, Chemistry, Alkalinity, Hydrolysis, Measurement, Analysis, Laboratory tests.
Identifiers: *Ion product, *Activity coefficients, *Ionic strength, *Hydroxide ion concentration, Molar concentrations, Artificial seawater.

The ion product of water in seawater and the total activity coefficents of hydroxide and hydrogen ions were determined over the temperature range 2 to 35C and the salinity range 20 to 44 parts per thousand. At 25C and 35 parts per thousand salinity, the measured values were pK(SW)/W=13.20, the activity coefficient of the hydroxide ion equaled 0.22 and the activity coefficient of the hydrogen ion equaled 0.71 the molar concentration scale. (Henley-ISWS)
W76-01239

2. WATER CYCLE

2A. General

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W76-01031

INFILTRATION MODEL WITH REGARD TO THE SURFACE RUNOFF (EIN INFILTRATIONSMODELL UNTER BERUECKSICHTIGUNG DES LANDOBERFLAECHENABFLUSSES),
K. Theile.
Wasserwirtschaft/Wassertechnik, Vol 22, No 12, p 415-419, 1972. 4 fig, 2 tab, 10 ref.

Descriptors: *Model studies, *Surface runoff, Rainfall, Infiltration, Soils, Watersheds(Basins).
Identifiers: Surface retention, Horton's diffusion model.

An infiltration model, based on Horton's diffusion model, has been developed for the determination of runoff in watershed areas. The basic parameters of the computerized model are in principle measurable. As the surface runoff phase as a boundary condition of the infiltration process is considered, event-specific characteristics of the runoff formation are obtained. The initial water content in the ground immediately before rainfall constitutes a determining factor for the relationship of infiltration to surface runoff as it influences the surface retention and the soil infiltration capacities. Watershed areas with fairly homogeneous vegetation are subdivided into wet parts responsible for surface runoff and dry parts with high infiltration capacity for modeling purposes. Applications of this model to areas with abundant precipitation show good agreement with observations. (Sandoski-FIRL)
W76-01053

CONCEPTUAL MODEL DESIGN FOR MOTORWAY STORMWATER DRAINAGE,
C. J. Swinnerton, M. J. Hall, and T. O'Donnell.
Civil Engineering and Public Works Review, Vol 68, No 799, p 123, 125-127, 129, February, 1973. 4 fig, 2 tab.

Descriptors: *Model studies, *Drainage, Storm water, Rainfall-runoff relationships, Rainfall intensity, Hydrographs.
Identifiers: Highway drainage, Road runoff.

Highway drainage is complicated by the necessity to drain both the pavement and the shoulder in one continuous system. In an attempt to clarify the factors which affect the design of such systems, the Road Research Laboratory began in late 1960 to collect rainfall and runoff data at six sites. Subsequent analysis of some 17 station-years of data under the terms of a research contract between the Road Research Laboratory and the Imperial College of Science and Technology, University of London, has indicated the feasibility of using a conceptual modeling technique for design purposes. The conceptual model which forms the basis of the proposed design method consists of a single linear reservoir having two alternate values of its storage parameters, namely k1 for periods of rain and k2 for periods of no rain. Using the total rainfall on only the impervious area as input, the model estimates runoff hydrographs using equations for periods of rain and for periods of no rain. The time interval used in the present study was two minutes and the units of rainfall intensity and rate of runoff were inches per day. The value of k1 and k2 to be used for any given site and rainfall distribution may be estimated from the equations. (Sandoski-FIRL)
W76-01062

NO-TILLAGE SYSTEM REDUCES EROSION FROM CONTINUOUS CORN WATERSHEDS,
Agricultural Research Service, Coshocton, Ohio.
For primary bibliographic entry see Field 2J.
W76-01078

SEDIMENT YIELD FROM SOUTHWEST IDAHO RANGELAND WATERSHEDS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2J.
W76-01086

NUTRIENT AND SEDIMENT DISCHARGE FROM AGRICULTURAL WATERSHEDS IN OKLAHOMA,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
A. Olness, S. J. Smith, E. D. Rhoades, and R. G. Menzel.
Journal of Environmental Quality, Vol 4, No 3, p 331-336, July - September, 1975. 1 fig, 3 tab, 19 ref.

Descriptors: *Surface runoff, *Sediment yield, *Agricultural watersheds, *Nitrogen, *Phosphorus, *Ranges, Nutrients, Chemical analysis, Watershed management, Cultivated lands, Fertilizers, Oklahoma, Soil erosion, Precipitation(Atmospheric), Rainfall-runoff relationships, Runoff, Topsoil, Vegetation effects, Nitrates, Grazing, Range management.
Identifiers: Ranageland watersheds.

Seven cropland watersheds and four rangeland watersheds in central Oklahoma were monitored for surface hydrology and discharge of nitrogen, phosphorus, and sediment over a 1 year period in which precipitation and runoff were much above normal. Sediment losses from the continuancy grazed rangeland watersheds ranged from 18 to 23 metric tons/hectare during the study. None of the sediment losses from the other watersheds exceeded 10 metric tons/hectare. Total nutrients discharged in runoff ranged from 2 to 15 kilograms/hectare of N and 1 to 11.5 kilograms/hectare of P. Flow-weighted mean concentrations ranged from 1 to 6 parts per million of total N, 0.2 to 1.9 ppm of nitrate-N, 0.5 to 4.8 ppm of total P, and 0.04 to 0.9 ppm of soluble P. Cropland watersheds had much greater concentrations of soluble phosphorus in runoff than rangeland watersheds. Loss of fertilizer N and P did not exceed 5 percent of the most recent applications, even though surface runoff was 4 to 10 times greater than that observed in previous years. (Robinett-Arizona)
W76-01116

WATER RESOURCE SYSTEMS AND RELATIONS,
Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.
H. E. Schwarz.
Reviews of Geophysics and Space Physics, Vol 13, No 3, p 468-472, 525-528, July, 1975. 137 ref.

Descriptors: *Water resources, *Groundwater resources, *Water sources, *Synthetic hydrology, Networks, Surface water availability, Hydrologic cycle, Water management(Applied), Water policy, Water quality, Water resources development, Water supply, Water utilization, Surface-groundwater relationships, Surface waters, Hydrology, Groundwater, Mathematical models, Stochastic processes, Systems analysis, Decision making.
Identifiers: Stochastic flow models.

Water resources systems analysis has come to mean the use of mathematical programming and simulation techniques in the study of large-scale systems which control the movement of water on and under the surface of the earth. In addition to the use of these techniques in analyzing and synthesizing physical systems, significant inputs are being made to broaden the analysis to social, economic, and environmental considerations. A review is presented of surface water systems, groundwater systems, water quality systems, stochastic flow models, decision theory, and network theory. (Robinett-Arizona)
W76-01118

SNOWPACK DYNAMICS IN RELATION TO INVENTORY-PREDICTION VARIABLES IN ARIZONA MIXED-CONIFER,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. A. Warren.

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Master of Science Thesis, 1974. 77 p, 6 fig, 5 tab, 53 ref, 3 append.

Descriptors: *Snowpacks, *Snowmelt, *Radiation, *Coniferous forests, *Snow management, Arizona, Runoff, Snowfall, Runoff forecasting, Snow surveys, Water sources, Water supply, Snow, Canopy, Interception, Slopes, Cutting management, Water yield, Statistical methods, Regression analysis.
Identifiers: Snow accumulation, Radiation duration.

Snowpack measurements were made on 93 plots for 6 different dates during the winter of 1973-1974 to determine the forest-terrain-snow relationships of the mixed conifer forests in Arizona. Using regression techniques, two sets of equations were developed representing the accumulation and melt periods and storage-duration index. During the accumulation period, the 2 most dominant processes were the interception of falling snow by the overhead canopy and the duration of the sun's direct radiation on the plot. During the melt period, the slope and aspect and the duration of the sun's direct beam radiation on the plot were most dominant. The presence of timber was involved in 3 of the 4 most dominant processes during the entire winter season. Using this information as input, the land manager can develop cutting presecriptions within a multiple-use framework to yield the highest possible runoff. (Robinett-Arizona)
W76-01123

VALIDATION OF SNOWPACK INVENTORY PREDICTION RELATIONSHIPS IN ARIZONA PONDEROSA PINE FORESTS,
Arizona Univ., Tucson. Dept. of Watershed Management.
B. W. Welch.
Master of Science Thesis, 1975. 59 p, 11 fig, 16 tab, 31 ref.

Descriptors: *Snowpacks, *Snow management, *Runoff forecasting, *Water equivalent, *Forest watersheds, Arizona, Snow, Snow surveys, Snowmelt, Water yields, Melt water, Melting, Runoff, Local precipitation, Ponderosa pine trees, Mountain forests, Watershed management, On-site investigations.
Identifiers: Snowpack inventory prediction.

A validation study of snowpack inventory-prediction equations was conducted during 1972-73 in three study sites within the Arizona ponderosa pine forests. The orginial inventory-prediction equations proved inadequate, possibly because the snowpack water equivalent for 1972-73 was five-to-nine times above normal. New snowpack inventory-prediction equations were then developed. (McLachlan-Arizona)
W76-01127

MATHEMATICAL MODELLING OF AN AQUATIC ECOSYSTEM: I,
Wright State Univ., Dayton, Ohio.
For primary bibliographic entry see Field 5B.
W76-01195

DIMENSIONLESS INLET HYDROGRAPH MODEL,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, M. J. Root, and J. F. Miller.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY9, Proceedings Paper No 11580, p 1185-1195, September 1975. 5 fig, 1 tab, 11 ref, 1 append.

Descriptors: *Urban hydrology, *Hydrograph analysis, *Hydrology, *Hydraulics, *Unit hydrographs, *Urban runoff, *Simulation analysis, *Mathematical models, Storm runoff, Storm drains, Model studies.
Identifiers: *Inlet hydrographs, *Drainage design, Kinematic wave, Linked system models.

A number of mathematical models used to estimate storm hydrographs in urban areas consider runoff as a deterministic process and link a series of submodels to simulate the behavior of the various components of the runoff cycle. Because of the number of interrelated formulations in these linked system models, a large core computer is generally required for their proper use. A dimensionless inlet hydrograph was presented that can be developed from a complete linked system model and used as a substitute in some planning and design situations. The central objective was to develop a method for estimating the hydrograph entering an inlet or catch basin that would be simple enough to allow hand computations while retaining good agreement with the computer-generated hydrographs obtained with a complete linked system model. (Terstriep-ISWS)
W76-01256

WATER RESOURCES OF VOLCANIC ISLANDS, A PILOT PROJECT IN THE CANARIES,
D. Fernandopulle, R. H. Rodriguez, and J. S. Oiza.
Nature and Resources, Vol 11, No 1, p 8-12, January-March 1975. 1 fig, 1 tab.

Descriptors: *Water resources, *Islands, *Data collections, *Projects, Groundwater, Water wells, Aquifers, On-site investigations, On-site data collections, Runoff, Evaporation, Pumping, Infiltration, Water balance, Water supply, Agriculture, Water properties, Surface runoff, Rainfall, Geochemistry, Sounding, Analytical techniques, Groundwater movement, Analysis, Networks, Surveys, Hydrology, Hydrogeology, Model studies, Sampling, Management, Planning.
Identifiers: *Canary Islands(Spain), Volcanic islands, Galleries.

The project for the Scientific Study of the Water Resources of the Canary Islands, carried out in 1970-1974 by Spain, UNESCO, and the United Nations Development Program, served as a pilot for the planning of water-resource management in islands of volcanic origin. Hydrometeorological and hydrogeological networks furnished data on surface runoff evaporation, water levels in wells, pumping systems, and physico-chemical characteristics of the water. Detailed studies were carried out to test the behavior and 'limits' of given parameters by means of infiltration tests using controllable sprinklers, pumping tests, and plot tests to determine consumption in agriculture. Special investigations included electrical and seismic soundings, use of infra-red technique to detect offshore springs, analysis of stable isotopes and tritium in the water, special borings, experimental geochemical study of the water-rock relationship, and simulation of the aquifer by models. The data acquired during the project resulted in a better understanding of water resources available for current and future use and provided a basis for management policies. Emphasis should be placed on the construction of deep wells in the most suitable parts of the island, and the drilling of sloping gallery wells or controlled-discharge wells in coastal areas. It was demonstrated that it is possible and necessary to treat a whole island as a single hydraulic unit. The importance of vertical secondary fissures to groundwater movement and stratification were brought to light. (Robinson-ISWS)
W76-01258

THE IMPORTANCE OF ACCURATE CURVE NUMBERS IN THE ESTIMATION OF STORM RUNOFF,
Utah State Univ., Logan. Watershed Science Unit.
R. H. Hawkins.
Water Resources Bulletin, Vol 11, No 5, p 887-891, October 1975. 2 fig, 3 ref, 1 append.

Descriptors: *Storm runoff, *Rainfall-runoff relationships, Hydrology, Runoff, Rainfall, Storms.
Identifiers: *Curve number, *Error analysis.

Storm runoff as calculated by the runoff curve number method was shown to be of varying sensitivity to both input rainfall and curve number. This method was used to estimate rainstorm runoff volume on ungaged small watersheds for specific storms. Using an assumed input error of 10%, a runoff error chart was given. Up to about 9 inches of rainfall, runoff was more sensitive to curve number than to rainfall. An accurate estimate of curve number was clearly the weak input link for the method, and the importance of accurate curve number selection in this range was stressed. This 10% error, however, may arise solely from physical conditions in the watershed. More engineering and research attention should be paid to representative watershed studies with curve numbers in mind. (Lardner-ISWS)
W76-01305

CLASSIFYING STORM RUNOFF POTENTIAL WITH PASSIVE MICROWAVE MEASUREMENTS,
Agricultural Research Service, Chickasha, Okla
For primary bibliographic entry see Field 7B.
W76-01306

CALIFORNIA HIGH WATER, 1972-1973,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 2E.
W76-01315

FLOOD OF JUNE 1972 IN THE SOUTHERN PEACE (SMOKY RIVER) BASIN, ALBERTA,
Department of the Environment, Calgary (Alberta). Water Resources Branch.
For primary bibliographic entry see Field 2E.
W76-01316

HYDROGRAPH SYNTHESIS USING MATHEMATICAL MODELS,
Wollongong Univ. Coll. (Australia). Dept. of Civil Engineering.
M. J. Boyd.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers, Australia, Preprints of Papers, p 117-121, May 1975. 3 fig, 7 tab, 13 ref.

Descriptors: *Hydrographs, *Mathematical models, Routing, Storm runoff, Unit hydrographs, Watersheds(Basins), Rainfall-runoff relationships.

Four mathematical catchment models are examined with regard to the synthesis of storm runoff hydrographs. All models compare favourably with the unit hydrograph method while considerable improvement is obtained by the more realistic models. Model parameters, derived by fitting hydrographs, are shown to correlate highly with the catchment characteristics. (CSIRO)
W76-01418

AN EVALUATION OF THREE RAINFALL-RUNOFF MODELS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
I. D. Moore, and R. G. Mein.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 122-126, May 1975. 6 tab, 6 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, Watersheds(Basins), Computer models, Australia, Testing, Evaluation, Optimization, Model studies.

Three mathematical rainfall-runoff models, the Boughton model (with a modification to include base flow), the Monash model, and the Stanford Watershed model (slightly modified for daily input data) were applied to four catchments in Australia

on a daily basis. The procedure used was to fit the model parameters on several years of data and to test the model performance on a different data period. Evaluation of the models is made on results, ease of use, and computational time required. (CSIRO)
W76-01419

PROBLEMS IN THE PROGRAMMED OPTIMISATION OF A HYDROLOGICAL CATCHMENT MODEL,
Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Land Use Research.
M. J. Goodspeed.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 127-130, May 1975. 2 fig, 1 tab, 13 ref.

Descriptors: *Optimization, *Demonstration watersheds, *Rainfall-runoff relationships, *Computer models, Model studies, Watersheds(Basins), Small watersheds.

Investigations carried out in a search for the most appropriate method for optimisation of a deterministic model to be used in the Australian Representative Basins Programme are outlined. With efficiency of use of computing time as a major objective, a simple model which could simulate rainfall-runoff behaviour reasonably well was formulated. Trial optimisations were then performed by two methods for a chosen representative basin. In each case the effects of varying the objective function was studied. (CSIRO)
W76-01420

SIMULATION OF THE RAINFALL-RUNOFF PROCESS USING A HYSTERETIC INFILTRATION-REDISTRIBUTION MODEL,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
K. K. Watson, and S. J. Lees.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 131-135, May 1975. 6 fig, 11 ref.

Descriptors: *Soil profiles, *Infiltration, *Hysteresis, *Rainfall-runoff relationships, *Numerical analysis, Soil moisture, Water storage, Hyetographs, Depression storage, Mathematical models.

The significance of the soil profile and its accompanying water status in deterministic models is discussed in relation to the current use of the soil-store concept. An alternative numerical approach is described in which the movement of water into and through the soil profile (together with the determination of runoff volumes) is continuously monitored during any pattern of rainfall and non-rainfall events. A significant component in the approach is the use of a comprehensive domain-type hysteresis model for the analysis of infiltration-redistribution sequences. The simulation is illustrated by using a rainfall hyetograph of seven hours durat ion (including one non-rainfall period of one hour) as the flux input into a homogeneous profile of a sandy loam of uniform initial water content. The time-dependent relationships of rate of surface flux, depression storage and runoff volume are calculated for the furation of the hyetograph period. Profiles of water content are also presented. (CSIRO)
W76-01421

FLOOD FREQUENCY DISTRIBUTION IN A CATCHMENT SUBJECT TO TWO RAINFALL PRODUCING MECHANISMS,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch.
N. M. Ashkanasy, and W. D. Weeks.
In: Hydrology Symposium, Armidale, Australia. 1975. The Institution of Engineers Australia, Preprints of Papers, p 153-157, May 1975. 3 fig, 6 tab, 6 ref.

Descriptors: *Storm structure, *Statistical methods, *Frequency analysis, *Flood frequency, Storm runoff, Flood peak, Watersheds(Basins), Rainfall-runoff relationships, Peak discharge, Rainfall disposition.

Traditional techniques for determining the statistical distribution in estimation of extreme flood events in an apparently typical catchment are shown to yield contradictory results. The physical significance of this failure is explained. A dual log-normal approach yields a more reasonable estimate, but it is suggested that some uncertainty remains. A major conclusion is that at least in certain cases, extreme events belong to a statistical population which is entirely distinct from that of ordinary annual maxima; the existence of this phenomenon can only be detected by a careful consideration of physical processes. (CSIRO)
W76-01425

COMPARISON OF SOME CALCULATION METHODS FOR RAINWATER RUNOFF (VERGLEICH EINIGER BERECHNUNGSMETHODEN VON REGENWASSERKANALISATIONEN),
J. F. Gruhler, and V. Adamik.
Wasserwirtschaft-Wassertechnik, Vol 25, No 7, p 239-242, 1975. 2 fig, 2 tab, 11 ref.

Descriptors: *Mathematical studies, *Storm runoff, *Rainfall-runoff relationships, Sewerage, Sewers, Storage, Forecasting, Rain water, *Methodology.

The Imhoff-Reinhold; Hauff-Vikari-Kehr; Gruhler; and Pecher methods; the hydrographic method developed in the United States; and a method developed in the USSR for the calculation of rainwater runoff are compared. These calculation methods involve widely differing calculation time requirements, and considerably different sewer system investment costs. The time coefficient method developed by Imhoff and Reinhold is applicable to the construction of most new projects. The Hauff-Vikari-Kehr method may be necessary in special cases, such as for large new sewer networks. The resources of existing sewer systems that may have to be enlarged are best investigated by the Gruhler method, with respect to their storage capacities. (Takacs-FIRL)
W76-01426

2B. Precipitation

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: I. SEASONAL FLUCTUATIONS IN THE HEIGHT OF THE GROUND WATER TABLE,
Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 2F.
W76-01230

RAINDROP-SIZE DISTRIBUTIONS IN THE MELBOURNE AREA,
Bureau of Meteorology, Melbourne (Australia).
P. A. Barclay.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 112-116, May 1975. 2 fig, 3 tab, 10 ref.

Descriptors: *Raindrops, *Distribution patterns, *Radar, Rainfall intensity, Classification, Size, Measurement, Synoptic analysis, *Australia.
Identifiers: Melbourne(Vic).

The results of measurements of raindrop distributions in Melbourne, Australia, and the classification of these distributions to demonstrate the differences for given rain types and for rain from different synoptic situations is presented. An important relationship between radar reflectivity factor Z and rainfall rate R, both measured from the drop-size distributions is determined for each classification with a view to subsequent use in radar rainfall measurement. The equipment used to measure raindrop size is briefly outlined. (CSIRO)
W76-01417

A PHOTOGRAPHIC TECHNIQUE FOR MEASUREMENTS OF ATMOSPHERIC PARTICLES IN SITU FROM AIRCRAFT,
National Center for Atmospheric Research, Boulder, Colo.
T. W. Cannon.
Journal of Applied Meteorology, Vol 14, No 7, p 1383-1388, October 1975. 5 fig, 4 ref.

Descriptors: *Photography, *Particle size, *Aircraft, *Cameras, Particle shape, Drops(Fluids), Ice, Atmosphere, Storms, Rainfall, Cloud physics, Instrumentation, Equipment, Data processing, Meteorology.
Identifiers: *Atmospheric particles.

In situ photographs were taken of atmoshperic particles with radius 4 micrometer and larger with a special particle camera installed on a research sailplane. Ice particle shapes, sizes and concentrations, raindrop sizes and concentrations, and microscopic cloud particle concentrations and size estimates were obtained from the photographs. Liquid particles could be distinguished from ice particles if their radii exceeded about 50 micrometer. (Sims-ISWS)
W76-01472

A REEXAMINATION OF THE EQUILIBRIUM CONDITIONS IN THE THEORY OF WATER DROP NUCLEATION,
Mainz Univ. (West Germany). Institut fuer Meteorologie.
F. Herbert.
Tellus, Vol 27, No 4, p 406-413, 1975. 1 fig, 14 ref.

Descriptors: *Nucleation, *Drops(Fluids), *Aqueous solutions, Water vapor, Evaporation, Condensation, Equilibrium, Cloud physics, Cloud seeding, Weather modification, Precipitation(Atmospheric), Meteorology, Thermodynamics.
Identifiers: *Equilibrium conditions, Curvature, Kelvin equation.

The thermodynamic equations necessary to describe the conditions for equilibrium between a highly curved surface of a liquid and its vapor were re-examined. The complete equilibrium behavior was reduced to one single differential equation for each component in an arbitrary c-component system. It was shown that this general formulation can be specialized to describe the conditions for equilibrium between water vapor and a pure water drop, the drop carrying an electric charge, containing a water soluble substance, and/or containing a water insoluble nucleus. In the light of the present formulation, some incorrect physical statements of treatments by various authors reported in literature were pointed out. In an added note, the energy of homogeneous water drop formation was discussed and some erroneous conclusions which commonly are drawn in the literature from formulations on the energy of nucleus formation were mentioned. (Sims-ISWS)
W76-01478

FREEZING NUCLEATION IN AQUEOUS ELECTROLYTES,
Wyoming Univ., Laramie. Dept. of Atmospheric Sciences.
M. T. Reischel, and G. Vali.

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Tellus, Vol 27, No 4, p 414-427, 1975. 9 fig, 4 tab, 31 ref. Bureau of Reclamation, 14-06-D-6801, NWC N000123-72-C-0911.

Descriptors: *Nucleation, *Freezing, *Aqueous solutions, *Electrolytes, Laboratory tests, Silver iodide, Salts, Drops(Fluids), Chemistry of precipitation, Precipitation(Atmospheric), Weather modification, Cloud seeding, Chemistry, Meteorology.

Experiments were performed to determine the extent to which the nucleating abilities of artificial and natural freezing nuclei are influenced by the presence of salts dissolved in water. Four different nucleants (at fixed concentrations) were tested in combinations with 10-20 soluble salts using the drop freezing technique. Changes in freezing temperatures were determined for each nucleant-salt combination at salt concentrations of 0, 0.01, 0.1 and 1 molal. Major differences were noted in the responses of the different nucleants and it was concluded that the influence of dissolved salts on heterogeneous freezing nucleation is not due to changes in the bulk water structure, but results from modifications at the nucleant-embryo interface. The measurements indicated that the salt contents of cloud droplets can be expected to alter the ice nucleating activities of suspended particles by as much as plus or minus 4C. (Sims-ISWS)
W76-01479

THE LIFE CYCLE OF CALIFORNIA COASTAL FOG ONSHORE,
Calspan Corp., Buffalo, N.Y.
C. W. Rogers, E. J. Mack, U. Katz, C. C. Easterbrook, and R. J. Pilie.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A003 392, $5.00 in paper copy, $2.25 in microfiche. Report No CJ-5076-M-3, September 1974. 96 p, 17 fig, 4 tab, 10 ref, 3 append. AFCRL F19628-72-C-0160.

Descriptors: *Fog, *Coasts, *California, Sea breezes, Land breezes, Winds, Temperature, Drops(Fluids), Aerosols, Clouds, Condensation, On-site investigations, Meteorology.
Identifiers: *Fog microphysics, Visibility.

The life cycle of California coastal fog was investigated by examining visibility, temperature, and wind data obtained on a 56 m tower in 10 fog occurrences at Vanderberg Air Force Base in July 1972. The Vandenberg radiosonde data showed that fog did not form when the base of the large scale subsidence inversion was located 400 m or more above the earth's surface. Fog formed at the surface as the base of the oceanic stratus cloud lowered in response to net long wave radiational cooling at the cloud top after sunset. With strong onshore gradient winds, fog was a quasi-steady state phenomenon during the period between fog formation in the evening and fog dissipation by evaporation after sunrise. With weak onshore gradient winds (strong sea breeze circulation), an offshore land breeze occurred near midnight and brought visibility improvement produced by heating over the land. The amount of improvement was inversely related to the time after sunset of the onset of the land breeze, and was directly related to the visibility values present prior to the wind shift. The subsequent shift to onshore flow after midnight brought quasi-steady state fog conditions until dissipation occurred after sunrise. Fog microphysics data acquired in the 10 fogs were found to be consistent at the surface with previous observations in coastal fogs occurring both on land and at sea. The measurements showed, further, that drop concentration and liquid water content increased with height while mean droplet size and visibility decreased with height at least to 42 m above the surface. (Sims-ISWS)
W76-01493

2C. Snow, Ice, and Frost

VALIDATION OF SNOWPACK INVENTORY PREDICTION RELATIONSHIPS IN ARIZONA PONDEROSA PINE FORESTS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-01127

GLACIERS.
Proceedings of Workshop Seminar, 1970, Vancouver, British Columbia University, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada). 61 p, 1 append. J. Demers, editor. (1970).

Descriptors: *Glaciers, *International hydrological decade, *Conferences, Canada, Programs, Hydrology, Census, Regime, Ice, Glaciology, Climatology, Melting, Cold regions, Climates, Ablation, Physics, Radiation, Temperature, Tracers, Radioisotopes.
Identifiers: *Canadian National Committee, Ice shelf, Mass balance.

Key problems connected with glacier studies were discussed. The subject areas included the Canadian International Hydrological Decade program, combined balance studies, mass balance measurements, the regime of the Ward Hunt ice shelf and of the ice in the mouth of Nasen Sound, Canadian glacier inventory, hydrology, experimental studies of glacier climatology, melt-climate relationships, the relation between ablation and global radiation, application of ice physics, temperature measurements, and application of isotope techniques. (See W76-01241 thru W76-01252) (Humphreys-ISWS)
W76-01240

GLACIER STUDIES IN THE CANADIAN IHD PROGRAM,
Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.
O. H. Loken.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 1-4 (1970). 1 tab.

Descriptors: *Glaciers, *International Hydrological Decade, Canada, Programs, Glaciology, Assessments, Evaluation.

A short review of glacier studies included in the Canadian International Hydrological Decade (IHD) program was given. Six guide books prepared as a part of the IHD program were described. Organizational changes in relation to the glacier studies were described. Assessments were made of the ramifications this program has had for glaciological activities in Canada. (See also W76-01240) (Sims-ISWS)
W76-01241

COMBINED BALANCE STUDIES AT SELECTED GLACIER BASINS IN CANADA,
Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.
A. D. Stanley.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 5-9 (1970). 1 fig, 2 tab, 21 ref.

Descriptors: *Glaciers, *Hydrology, *Energy budget, *Water balance, Measurement, International Hydrological Decade, Glaciology, Basins, Melting, Ablation, Cold regions, Canada.
Identifiers: Mass balance.

The balance measurements being made at six selected glacier basins in western Canada were reviewed. Following an initial program to obtain mass balance measurements at a large number of basins, standard data are being collected each summer at these six glacier basins. Mass balance, water balance, and energy balance measurements are being made. The combined balances program at selected glacier basins has been successful in developing a unified approach to some aspects of the hydrology of alpine areas. (See also W76-01240) (Sims-ISWS)
W76-01242

MASS BALANCE MEASUREMENTS RELATED TO SURFACE GEOMETRY ON PEYTO GLACIER, ALBERTA,
McGill Univ. Montreal (Quebec). Dept. of Geography
G. Young.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 11-20 (1970). 8 fig, 4 ref.

Descriptors: *Glaciers, *Shape, *Snowfall, *Ablation, Melting, Measurement, Topography, Glaciology, Mapping, Cold regions, Canada.
Identifiers: Mass balance, Snow accumulation.

Progress on a study of the Peyto Glacier in Alberta, Canada, was reported. The hypothesis that is being tested is that the shape of the surface of the glacier is associated with both the patterns of accumulation and the patterns of melting. Shape or geometry parameters that are likely to be important are altitude, slope angle, azimuth of slope, and bumpiness of the surface. The most important conclusions reached so far are that accumulation patterns, while differing markedly for individual storms, tend to be similar at the end of each winter. However, gross amounts of accumulation can vary greatly and the overall patterns are not so similar that the pattern for one year will automatically be repeated in every detail the next year. (See also W76-01240) (Sims-ISWS)
W76-01243

THE REGIME OF THE WARD HUNT ICE SHELF AND OF THE ICE IN THE MOUTH OF NANSEN SOUND, ELLESMERE ISLAND,
Defence Research Board, Ottawa (Ontario).
G. Hattersley-Smith.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 21-22 (1970). 4 ref.

Descriptors: *Glaciers, *Ice, *Sea ice, Ablation, Regime, Climatology, Melting, Arctic Ocean, Cold regions, Canada.
Identifiers: *Ice shelves, Snow accumulation, Ellesmere Island.

The ice about Ward Hunt Island has been ablating at an average rate of only about 60 mm/yr since 1958, and has been accreting at the rate of about 30 mm/yr since 1963. It seems that ice conditions at the north end of Nansen Sound are reverting to what they were in the early part of the century, when travellers reported very old unbroken floes. Present climatic conditions off the north coast of Ellesmere Island allow very thick developments of landfast sea ice to form up to the point where they may be regarded as incipient ice shelves. (See also W76-01240) (Sims-ISWS)
W76-01244

THE CANADIAN GLACIER INVENTORY,
Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.
S. Ommanney.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian Ontario (Canada), p 23-30 (1970). 5 fig, 2 tab, 25 ref.

Descriptors: *Glaciers, *Surveys, *Mapping, *Canada, International Hydrological Decade, Water supply, Data collections, Ice, Water balance, Energy budget, Rocky Mountain region, Cold regions, Glaciology, Census.

In 1968 the Glacier Inventory Section was established within the Glaciology Subdivision and charged with completing the inventory of Canadian glaciers according to the International Commission of Snow and Ice recommendations and with carrying out other related studies. Only the glacier inventory of Axel Heiberg Island is finished and in print. Eleven hundred and twenty-one glaciers were identified covering 11,735 sq km or 31.5% of the total land area. Measurement of 191 glaciers on Vancouver Island has been completed and the final Vancouver Island glacier inventory report is in preparation. All the glaciers on Baffin Island (10,224), Bylot Island (575), and Devon Island (1,411) have been identified and index maps are in preparation or in print. Work maps have been compiled for several areas in the Rocky Mountains. This inventory of Canadian glaciers will establish a datum for all glaciers and will permit a more accurate calculation of the magnitude of the water supply potential of these glaciers. (See also W76-01240) (Sims-ISWS)
W76-01245

THE HYDROLOGY OF GLACIERS,
British Columbia Univ., Vancouver. Dept. of Geology.
W. H. Mathews.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 31-32 (1970). 7 ref.

Descriptors: *Glaciers, *Lakes, *Hydrology, Ice, Floods, Glaciology, Cold regions, Iced lakes, Canada.
Identifiers: Ice-dammed lakes.

One of the major problems encountered in the study of the hydrology of glaciers is setting up models to adequately account for phenomena which, for the most part, can be observed only from the exterior of the glacier or by remote sensing from its surface. The example of the ice-dammed Summit Lake in the Granduc area which periodically drains and floods the Salmon River below the ice dam illustrated this problem. The general behavior of Summit Lake was discussed along with the economic benefits of finding a way to control the flooding produced by such lakes. (See also W76-01240) (Sims-ISWS)
W76-01246

HYDROLOGY OF GLACIERIZED BASINS--SUMMARY OF RESEARCH BY GLACIOLOGY SUBDIVISION,
Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.
L. Derikx, and H. Loijens.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 33-35 (1970). 4 ref.

Descriptors: *Glaciers, *Hydrology, Instrumentation, Measurement, Ablation, Melt water, Streamflow, Headwaters, Melting, Model studies, Cold regions, Glaciology, Runoff, Canada.
Identifiers: Snow accumulation.

The research being done to study the glacier melt contribution to streamflow in the North Saskatchewan River headwaters and the hydrology of the Peyto Glacier was summarized. Measurements and instrumentation were described. Models and the analysis procedures were discussed. (See also W76-01240) (Sims-ISWS)
W76-01247

EXPERIMENTAL STUDIES ON GLACIER CLIMATOLOGY--ESPECIALLY FOR THE MELT-CLIMATE RELATIONSHIPS,
McGill Univ., Montreal (Quebec). Arctic Meteorology Research Group.
A. Ohmura.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 37 (1970).

Descriptors: *Glaciers, *Melting, *Climatology, Mathematical models, Glaciology, Radiation, Heat transfer, Meteorology, Instrumentation, Tundra, Cold regions.
Identifiers: Mass balance.

The two experimental studies presented are a part of the glacial-meteorological projects currently being carried out by the Axel Heiberg Expedition. The present experiment suggests that for the small- and middle-scale glaciers on Axel Heiberg Island, the tundra surface conditions and also the sea surface conditions will significantly influence the melting process for glaciers. If the thorough process of glacier melt is to be fully grasped, glaciologists must examine not only the glaciers themselves, but the surrounding areas as well. (See also W76-01240) (Sims-ISWS)
W76-01248

THE RELATION BETWEEN ABLATION AND GLOBAL RADIATION OVER PEYTO GLACIER, ALBERTA,
Toronto Univ., (Ontario). Dept. of Geography.
B. Goodison.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 39-42 (1970). 2 fig, 4 ref.

Descriptors: *Glaciers, *Ablation, *Radiation, Correlation analysis, Measurement, Ice, Meteorology, Melting, Glaciology, Cold regions, Canada.
Identifiers: Peyto Glacier.

During the 1969 field season, a micro-meteorological site was established on Peyto Glacier, and continuous measurement of the shortwave components of the radiation balance became an integral part of this project. In particular, one problem to investigate was the relationship between global radiation and surface ablation of the ice. A correlation analysis showed no significant relationship between these two variables. This can be explained because global radiation is only part of the radiation balance (and only a part of one term in the energy balance equation). Even the inclusion of the shadow effect results in a negligible change in the correlations. The present work is an initial study into the distribution of global radiation over Peyto Glacier, and its relationship to ablation. There is a significant difference in the received solar radiation for any area depending upon its slope, azimuth, and perhaps shadow conditions, but these differences alone do not dictate any statistically meaningful relationship between the two variables. More information is required about the other radiation and energy balance components, both at a point and in a spatial context. (See also W76-01240) (Sims-ISWS)
W76-01249

THE APPLICATION OF ICE PHYSICS TO GLACIER STUDIES,
Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
W. S. B. Paterson.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 43-46 (1970). 21 ref.

Descriptors: *Glaciers, *Physics, *Measurement, Radioactivity, Estimating, Melt water, Tritium, Ablation, Cold regions, Glaciology, Ice, Snow, Dating.
Identifiers: *Ice thickness, Mass balance, Thermoluminescence, Snow accumulation.

Work in physics can help by suggesting alternative ways of obtaining information, either through providing a new technique or by using results derived from theoretical studies of glacier flow. In some cases, the alternative method may be better than the existing one; in others, it may at least be useful as a check. Several examples were described, including: (1) estimation of ice thickness, (2) estimation of mean annual ablation rate by measurement of emergence velocity, (3) estimation of ice thickness changes from strain rate measurements, (4) simplified mass balance measurements, (5) electrical methods of measuring ice thickness, (6) thermoluminescence, (7) radioactive fallout as a reference horizon for accumulation measurements, (8) measurement of tritium content to distinguish between meltwater from snow and meltwater from glacier ice, and (9) dating methods. (See also W76-01240) (Sims-ISWS)
W76-01250

TEMPERATURE MEASUREMENTS IN FOX GLACIER, YUKON TERRITORY,
British Columbia Univ., Vancouver. Dept. of Geophysics and Astronomy.
G. K. C. Clarke.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 47-48 (1970). 3 fig, 1 ref.

Descriptors: *Glaciers, *Temperature, Ice, Measurement, Thermal properties, Glaciology, Cold regions, Canada.
Identifiers: Fox Glacier, Yukon Territory.

Fox Glacier lies in the Steele Creek drainage basin in the Icefield Ranges, Yukon Territory. It is a small (4 km long) surging glacier, at present in its quiescent phase. To investigate the thermal regime, thermistor cables were inserted in holes made with electrically-powered thermal drills. All temperatures were below the pressure melting point except in hole 7, at the bottom of which a layer, some 10 m thick, of ice at the pressure melting point was encountered. There were no 'hot spots' other than the one in the vicinity of hole 7. That the glacier has this peculiar thermal regime must surely be related to its surge behavior. Whether the observed hot spot is the cause of the glacier's surge activity, or a consequence of its most recent surge, is still open to question. (See also W76-01240) (Sims-ISWS)
W76-01251

APPLICATION OF ISOTOPE TECHNIQUES TO GLACIER STUDIES,
Alberta Univ., Edmonton. Dept. of Physics.
H. R. Krouse.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 49-59 (1970). 9 fig, 23 ref.

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Descriptors: *Glaciers, *Radioisotopes, *Isotope fractionation, *Isotope studies, Flow, Climatology, Glaciology, Paleoclimatology, Precipitation(Atmospheric), Tracers, Ice, Cold regions, Canada.

Stable isotope studies show considerable promise for elucidating problems in glaciology. As many factors can alter isotope abundances, it is necessary to effect many measurements in order to obtain unambiguous interpretations. However, information can be obtained which is not available from other techniques. Therefore, the considerable amount of work involved seems justified. (See also W76-01240) (Sims-ISWS)
W76-01252

MEANDERING OF SUPRAGLACIAL MELT STREAMS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-01261

TOWARD NEW MASS AND HEAT BUDGETS FOR THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
K. Aagaard, and P. Greisman.
Journal of Geophysical Research, Vol 80, No 27, p 3821-3827, 1975. 1 fig, 3 tab, 26 ref. ONR N00014-67-A-0103-0023, N00014-67-A-0103-0021.

Descriptors: *Heat budget, *Arctic Ocean, *Mass, *Advection, Heat flow, Subsurface waters, Ice, Shear, Bathymetry, Water temperature, Current meters, Heat balance.
Identifiers: *Mass budget, West Spitsbergen Current, Eurasian Basin, Baffin Bay, East Greenland Current, Bering Strait, Geographic features, Net heat flux, Water budget, Salt budget.

Recent current measurements were incorporated into new heat and mass budgets for the Arctic Ocean. These budgets demonstrated the overwhelming importance of advection by the West Spitsbergen Current, which in 1971-1972 transported 16.3 times 10 to the 9th power kcal/sq cm/s into the Arctic Ocean. Partially on the basis of the heat budget, it was suggested that there was a large heat loss to the atmosphere in the southwestern Eurasian basin, in excess of 20 kcal/sq cm/yr. Annual mean transport in the West Spitsbergen Current could easily have varied by 35% and might have constituted a significant perturbation on the Arctic heat budget. The mass budgets pointed toward the general ineffectiveness of the Arctic Ocean in transforming subsurface water masses, and they also indicated a large shear between the ice and the upper layer of the East Greenland Current. (Roberts-ISWS)
W76-01297

MORPHOLOGY OF AN ARCTIC RIVER BAR,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
L. S. McKenzie, III, and H. J. Walker.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 586, $4.00 in paper copy, $2.25 in microfiche. Technical Report No 172, November 1974. 32 p, 48 fig, 35 ref. ONR N00014-69-A-0211-0003.

Descriptors: *Arctic, *Sand bars, *Geomorphology, *Alaska, Rivers, Coasts, Glaciology, Ice, Climatology, Erosion, Sedimentation, Cold regions, Land forming, Running waters, Floods, Sedimentology, Alluvium, Alluvial channels, Sediments, Deltas, Permafrost.
Identifiers: *Colville River(Alas).

River bars are a common landscape element in the valleys of the coastal plain of northern Alaska. They are especially numerous in the Coleville River delta, the largest delta north of the Brooks Range. Most river bars in the Arctic are submerged for only a short period of time during river breakup, and most of those occurring on the lee side of river channels are bordered by sand dunes. Putu bar, located near the head of the Colville delta, is of this type. Like other river bars, it possesses a number of small forms. The structural and temporal variation of some 18 microrelief features was investigated during the 1971 field season, which lasted from before the initiation of snowmelt in late winter to late summer. Each feature was classified as to when it formed, how long it persisted, and what processes were involved. It was found that winter, although it prevails throughout most of the year, is generally a period of little activity on Putu bar. Most alterations on the bar are the result of the fluvial activity occurring during the short spring and summer. Cryoturbation, an important process in the development of many arctic landforms, is negligible in the formation of the microrelief features investigated on Putu bar. (Sims-ISWS)
W76-01319

ACCUMULATING SNOW TO AUGMENT THE FRESH WATER SUPPLY AT BARROW, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N. H.
C. W. Slaughter, M. Mellor, P. V. Sellmann, J. Brown, and L. Brown.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-005-031, $3.50 in paper copy, $2.25 in microfiche. Special Report 217, January 1975. 21 p, 12 fig, 4 tab, 16 ref, append.

Descriptors: *Snow management, *Water supply, *Alaska, Windbreaks, Permafrost, Reservoirs, Runoff, Snowfall, Snowmelt, Surface waters, Water storage, Water distribution(Applied), Water delivery, Arctic, Cold regions, Snow, Snowpacks.
Identifiers: *Snow accumulation, Barrow(Alaska), Snow fence.

With appropriate snow management techniques, it appears that local freshwater runoff could be significantly increased in northern Alaska to provide additional water for community needs. At Barrow, Alaska, snow fences 1.5 and 2.7 m high were installed in September 1972 at two orientations (north-south and east-west). By February 1973 the fences were near saturation. Influence of the fences was evident at 10-15 times fence height on both sides of the fences. Surface reworking and slight accumulation increases were shown in subsequent April and June measurements. Snow accumulation on adjacent, relatively flat terrain at all three measurement times was about 40 cm depth. The average increase in water equivalent over the drift cross section for the 1.5 m fence was 15 cm, with a maximum of 50 cm within 1.0 m of the fences. For the 2.7 m fence, the average increase in water equivalent was 45 cm, with a maximum of 1.5 m within 1 meter of the fence. Snow density at each measurement time was in the range of 0.40 to 0.55 g/cu m. (Roberts-ISWS)
W76-01323

UNIVERSITY OF WASHINGTON WATER STRESS STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
L. K. Coachman, and J. D. Smith.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A005 373, $3.50 in paper copy, $2.25 in microfiche. Technical Report No 2, January 1971. 8 p, 1 fig, 19 ref. ONR N00014-67-A-0103-0021.

Descriptors: *Sea ice, *Arctic Ocean, *Ocean currents, Hydrodynamics, Ocean waves, Boundary layers, Boundary processes, Projects, On-site investigations, Fluid mechanics, Stress, Oceanography.
Identifiers: *Water stress.

During the 1970 AIDJEX Pilot Study, the University of Washington oceanographic study explored possible techniques for measuring water stress on the ice and ice deformation. The specific experiments outlined for the 1971 pilot study were: (1) the measurement of the time-dependent velocity and Reynolds stress fields in the nonuniforms turbulent boundary layer under the ice; (2) current measurements to relate the deeper flows to those in the boundary layer; (3) to measure the approach to geostrophy of the flow; and (4) accurate positioning of the two satellite stations as well as of the main station, so that the deformation of the triangle could be followed. (Sims-ISWS)
W76-01485

THEORETICAL CALCULATIONS OF INTERNAL WAVE DRAG ON SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
F. Rigby.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A003 614, $3.50 in paper copy, $2.25 in microfiche. Technical Report No 26, 1974. 12 p, 6 fig, 9 ref. ONR N00014-67-A-0103-0007.

Descriptors: *Sea ice, *Internal waves, *Drag, *Arctic Ocean, Hydrodynamics, Interfaces, Waves(Water), Ocean waves, Model studies, Mathematical models, Fluid mechanics, Dynamics, Stress, Oceanography.
Identifiers: *Water stress.

Because of the density stratification in the upper part of the Arctic Ocean, the movement of pressure ridge keels through the mixed layer can create internal waves in the vicinity of the pycnocline. These waves transport energy away from the keels and thereby generate drag on the ice. The study defined the conditions under which wave drag could contribute significantly to the total water stress. The development of internal waves downstream from a semielliptical keel was described by a simple two-dimensional, two-layer ocean model. Results calculated from the model showed the dependence of wave drag on keel depth, current speed, depth of the upper layer, and density change across the interface between the layers. Comparison of the relative magnitudes of form drag and wave drag suggested that wave drag is not negligible near large keels when the current is flowing strongly. (Sims-ISWS)
W76-01486

CHARACTERIZATION OF SLUSH ICE IN THE GREAT LAKES,
Coast Guard Research and Development Center, Groton, Conn.
J. P. Welsh, and B. T. Kingsbury.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A006 450, $3.50 in paper copy, $2.25 in microfiche. Report No CG-D-45-75, November 1974. 17 p, 10 fig, 3 tab.

Descriptors: *Ice, *Slush, *Lake ice, *Great Lakes, Surveys, On-site investigations, Measurement, Ice cover, Ice-water interfaces, Iced lakes, Navigation, Lakes.
Identifiers: *Slush ice.

Slush ice is a mixture of fresh water ice and water. It becomes an impediment to navigation when wind and water current transport the ice fragments into a restricted channel or harbor. The characteristics of slush ice identified and measured were draft, ice to water ratio (surface aspect only), and ice particle size distribution. Draft was measured using a sonar transducer set on the bottom of a channel and echoing off the underside of the slush ice. The water to ice ratio was obtained from photographs of slush ice taken from a helicopter. The ice particle size distribution was obtained by physically measuring ice particles in the field. The last technique is only useful where one can walk

on the slush ice. The ability to gather other data that may characterize slush ice is hindered by many factors. For example, conventional approaches to field observation and sampling are not very useful. One reason is that slush ice cannot always be walked on. (Sims-ISWS)
W76-01487

METHODS OF AVALANCHE CONTROL IN WASHINGTON MOUNTAIN HIGHWAYS--SUMMARY REPORT,
Washington Univ., Seattle. Dept. of Civil Engineering; and Washington Univ., Seattle. Geophysics Program.
E. R. LaChapelle, C. B. Brown, and R. J. Evans.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 107, $3.50 in paper copy, $2.25 in microfiche. Research Program Report 8.6, July 1974. 18 p, 1 tab, 12 ref, 2 append.

Descriptors: *Avalanches, *Protection, *Highways, *Washington, Snow, Snow management, Hazards, Disasters, Safety, Mountains, Forests.
Identifiers: *Avalanche control.

This summary report synthesized the work on avalanche control carried out at the University of Washington from 1970-1974. The annual reports contained a full account of all of the activities and should be referred to for further details. Five problems were faced in the protection of a highways from avalanche catastrophe. These were: (1) identification of avalanche paths, (2) description of historical frequency and size of avalanches, (3) prediction of avalanching, (4) identification of control methods, and (5) inclusion of control and prediction schemes in highway design and operation. The summary was intended to bring together the four-year study under the problem titles identified. Most of the work has been addressed to the specific features of the North Cascades Highway (SR-20) in the North Cascade Mountains of Washington State. Applications to other sites were mentioned as they arose. (Sims-ISWS)
W76-01492

2D. Evaporation and Transpiration

ESTIMATING EVAPORATION AND TRANSPORTATION FROM CLIMATOLOGICAL OBSERVATIONS,
Dept. for the Environment. Ottawa (Ontario). Hydrology Research Div.
F. I. Morton.
Journal of Applied Meterology, Vol 14, No 4, p 488-497, June, 1975. 5 fig, 10 ref, append.

Descriptors: *Evaporation, *Transpiration, *Model studies, *Estimating, *Climatic data, Physical properties, Climatology, Evaporation pans, Evapotranspiration, Hydrologic cycle, Solar radiation, Temperature, Water balance, Water loss, Humidity, Systems analysis, Mathematical models, Synthetic hydrology, River basin, Air temperature, Photoperiodism.

Evaporation and transpiration are estimated from routine climatological observations using a conceptual model that requires no assumptions concerning the availability of water. The versatility of this unorthdox approach is demonstrated by comparing model and water budget estimates for 118 river basins in Canada, Ireland and the southern United States. This technique provides estimates of evaporation and transpiration from a large area from interactions with the temperature, humidity and sunshine duration without using local fudge factors. The model requires accurate humidity data. It cannot be used near sharp environmental discontinuities, for short time periods, for deep lakes with large seasonal changes in subsurface heat storage, or to predict the effects of natural or man-made changes. (Robinett-Arizona)
W76-01122

EFFECT OF MOISTURE STRESS ON RED MAPLE SEEDLINGS FROM DIFFERENT SEED SOURCES,
Agricultural Research Service, Delaware, Ohio. Shade Tree Ornamental Plants Lab.
A. M. Townsend, and B. R. Roberts.
Can J Bot. Vol 51, No 10, p 1989-1995. 1973. Illus.
Identifiers: Acer-Rubrum *Maple trees, *Red maples, *Seedlings, Siblings, Swamps, *Moisture stress, Sites, *Transpiration.

Red maple (Acer rubrum L.) seedlings grown from half-sib seed collected from wet and dry sites were subjected to 3 levels of plant water stress. Transpiration on a per seedling and per unit leaf weight basis was greatest in seedlings from a swamplike site, at both high and low water potentials. Seedlings from the 2 wet sites came to temporary and permanent wilt sooner than seedlings from dry sites. However, at all levels of water stress, growth rates were greater for the seedlings from the wet sites than for those from the dry sites. At permanent wilt, the stem and leaf moisture content and the water potential values were highest in the seedlings from the swamplike site. At temporary wilt, the leaf water potential was lowest in seedlings from dry sites. Transpiration of seedlings from a swamplike site was double that of those from another wet site at the same leaf water potential.--Copyright 1974, Biological Abstracts, Inc.
W76-01196

SIMULATION OF EVAPORATION FROM BARE SOIL UNDER STEADY AND DIURNALLY FLUCTUATING EVAPORATIVITY,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences and Texas Agricultural Extension Service, College Station.
D. Hillel.
Soil Science, Vol 120, No 3, p 230-237, September 1975. 7 fig, 16 ref.

Descriptors: *Simulation analysis, *Soil moisture, Numerical analysis, Soils, Evaporation, Time, Computers, Diurnal distribution, Cycles, Soil surfaces, Computer programs, Model studies, Flow system.
Identifiers: *Mechanistic numerical model, *Potential evaporation, Resorption, IBM System/360, Cyclic egvaporativity, Vapor diffusion, Isothermal flow theory.

A mechanistic numerical model was designed to compare evaporation of soil moisture under steady versus fluctuating evaporativity. The model, written in IBM System/360 CSMP language, required data on soil hydraulic characteristics and on potential evaporation. It calculated the rate and cumulative quantity of evaporation, as well as the change in profile water content and distribution, as functions of time. Computations carried out for a 10-day simulation illustrated the use of the model. The results confirmed experimental findings that the diurnal cycle of evaporativity caused nighttime resorption of moisture and hence an appreciably higher average wetness in the soil surface zone. The results also predicted that under cyclic evaporativity, the total evaporation tended to be lower than under the equivalent steady evaporativity. (Roberts-ISWS)
W76-01302

COMPARISON OF WARM WATER EVAPORATION EQUATIONS,
Canterbury Univ., Christchurch (New Zealand), Dept. of Civil Engineering.
R. N. Weisman.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY10, Proceedings Paper 11620, p 1303-1313, October 1975. 2 fig, 2 tab, 12 ref, 2 append.

Descriptors: *Evaporation, *Turbulence, Turbulent flow, Water, Velocity, Convection, Water vapor, Heat transfer, Momentum equation, Model studies, Roughness(Hydraulic), Friction, Bodies of water, Hydrology, Fluid mechanics, Cooling water, Hydraulics.
Identifiers: *Warm water evaporation, *Turbulent diffusion, Forced convection, Sensible heat flux, Empirical model, Fluid mechanical model, Velocity profile, Friction velocity, Roughness length.

Two methods of calculating the evaporation and, using the Bowen ratio, the sensible heat flux from warm water bodies were presented and their results compared. One method was empirical in that free convective and forced convective terms were simply added. The other method was a fluid mechanical approach combining the effects of free and forced convection in a nonlinear way by the use of the Monin-Obukhov similarity theory. The comparison of results depended on the value of roughness length. A specific roughness lenght allowed the results of the two methods to compare within several percent. (Roberts-ISWS)
W76-01310

GAMMA--THE PSYCHROMETER NON-CONSTANT,
Atmospheric Environment Service, Calgary (Alberta).
D. Storr, and G. den Hartog.
Journal of Applied Meteorology, Vol 14, No 7, p 1397-1398, October 1975. 2 fig, 1 tab, 8 ref.

Descriptors: *Evapotranspiration, *Energy budget, *Estimating, Analytical techniques, Pressure, Elevation, Humidity, Equations, Meteorology, Hygrometry.
Identifiers: *Psychrometer constant, Gamma, Potential evapotranspiration.

Using 0.66 mb/degree K for gamma, the psychrometric constant, can cause underestimates of evapotranspiration in excess of 5% at elevations above 1000 m. Graphs and equations were presented to prevent this error and to facilitate the caluclation of evapotranspiration. (Sims-ISWS)
W76-01473

ENERGY BUDGETS FOR THREE SMALL PLOTS--SUBSTANTIATION OF PRIESTLEY AND TAYLOR'S LARGE-SCALE EVAPORATION PARAMETER,
Rocky Mountain Forest and Range Experiment Station, Tempe, Ariz.
J. R. Thompson.
Journal of Applied Meteorology, Vol 14, No 7, p 1399-1402, October 1975. 2 fig, 1 tab, 7 ref.

Descriptors: *Evaporation, *Forests, *Energy budget, *Arizona, Data processing, Evapotranspiration, Latent heat, Solar radiation, Equations, Temperature, Humidity, On-site investigations, Meteorology.

Eleven days of energy balance data from three unsaturated land surfaces were collected in the White Mountains of Arizona. These data indicated the variability in alpha for unsaturated conditions, and seemed to verify that a constant value of 1.26 exists for saturated conditions. The 'index of aridity' (alpha/1.26), though not entirely logical for small-scale use, also seemed to substantiate the large-scale parameter. (Sims-ISWS)
W76-01474

2E. Streamflow and Runoff

MATHEMATICAL MODEL FOR THE FILLING PROCESS OF THE RETENTION BASIN STOEHNA (MATHEMATISCHES MODELL FUER DEN FUELLVORGANIC DES

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HOCHWASSER-RUECKHALTEBECKENS STOEHNA),
M. Meyer, H. Martin, and W. Kraatz.
Wasserwirtschaft/Wassertechnik, Vol 22, No 11, p 382-386, 1972. 5 fig, 2 ref.

Descriptors: *Mathematical models, *Model studies, Flow, Flood peak, Rivers, Flood control, Flood gates.
Identifiers: Flood retention basins.

A mathematical model is shown applicable to the simulation of nonstationary flow processes occurring during the filling of similar flood gate-controlled retention basins. The nonstationary flow process makes it necessary to assume the inflow according to the progress line to be constant during discrete intervals. Partial inflows are determined for the preset geometrical boundary conditions of the flow profiles in assuming a steady state for the individual intervals. Branching and friction losses as well as secondary flow are not considered in the model. Designed to level off flood peaks in a river, this model constitutes a valuable element in the planned process control of flood retention basins. (Sandoski-FIRL)
W76-01054

THE UTILIZATION OF TREE-RING DATA TO PREDICT HYDROLOGIC PROPERTIES OF SEMIARID WATERSHEDS NEAR TUCSON, ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
J. K. Yu.
Master of Science Thesis, 1974. 106 p, 12 tab, 14 fig, 4 append, 87 ref.

Descriptors: *Climatic data, *Watersheds(Basins), *Dendrochronology, *Hydrologic cycle, *Runoff forecasting, Douglas fir trees, Runoff, Arizona, Streamflow, Flood forecasting, Flow, Precipitation, Mountain forests.
Identifiers: *Sabino Creek(Ariz), *Rincon Creek(Ariz), *Rillito Creek(Ariz), Tucson Basin(Ariz).

Four douglas-fir chronologies were collected from the mountains surrounding the Tucson basin. These tree-ring indices were analyzed and compared to the runoff records of Sabina Creek watershed, Rincon Creek watershed, and Rillito Creek watershed. The reconstructed data covered a 313 year period. The total variance explained by the prediction equation was 35% for Sabino Creek, 64% for Rillito Creek, and 34% for Rillito Creek. This runoff prediction was considered satisfactory for the Tucson Basin. (McLachlan-Arizona)
W76-01113

SURFACE WATERS,
National Weather Service, Silver Spring, Md.
J. C. Schaake, Jr.
Reviews of Geophysics and Space Physics, Vol 13, No 3, p 445-451, 494-496, July, 1975, 65 ref.

Descriptors: *Surface waters, *Streamflow, *Synthetic hydrology, *Hydraulics, *Mathematical models, Hydraulic models, Rivers, Runoff, Streams, Surface runoff, River flow, River forecasting, Watershed(Basins), Hydrographs, Overland flow, Statistical methods, Simulation analysis, Computer models, Probability, Land use, Bibliographies.

Discussed are work done and important advances made in the areas of river mechanics and streamflow routing, experimental study of overland flow, surface runoff models, partial area processes, effects of land use on surface runoff, and probability, statistics and analysis of uncertainty. In each area there was a fundamental need to apply mathematical and computer methods, and this is reflected in the review of progress in each of these areas. (Robinett-Arizona)
W76-01119

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-01176

SURFACE SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN--VOLUME 3. OHIO RIVER BASIN FROM LOUISVILLE, KENTUCKY, TO WABASH RIVER.
Geological Survey, Reston, Va.
Supt. of Documents, GPO, Wash., D.C. 20402 Price $5.20. Water-Supply Paper 2109, 1975. 633 p, 1 fig.

Descriptors: *Basic data collections, *Surface water, *Streamflow, *Flow rates, *Ohio River, River basins, Illinois, Indiana, Kentucky, Tennessee, Gaging stations, Runoff, Discharge(Water), Flow measurement, Average flow, Water levels, Lakes, Reservoirs, Hydrologic data.
Identifiers: *Ohio River basin, Maximum discharges, Minimum discharges.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Ohio River basin from Louisville, Kentucky, to Wabash River. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965 to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W76-01177

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 1.' NORTH ATLANTIC SLOPE BASINS--VOLUME 1. BASINS FROM MAINE TO CONNECTICUT.
Geological Survey, Reston, Va.
Supt. of Documents, GPO, Wash. D.C. 20402 Price $8.60. Water-Supply Paper 2101, 1975. 1123 p, 1 fig.

Descriptors: *Basic data collections, *Surface water, *Streamflow, *Lakes, *Northeast US, River basins, Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Water levels, Reservoirs, Hydrologic data.
Identifiers: *North Atlantic Slope basins, Maximum discharges, Minimum discharges.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the North Atlantic slope basins, Maine to Connecticut. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum and minimum discharges. (Woodard-USGS)
W76-01178

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1973,
Geological Survey, Austin, Tex.
R. M. Slade, Jr., and J. M. Taylor.
Open-file report, May 1975. 74 p, 2 fig, 3 tab.

Descriptors: *Hydrologic data, *Small watersheds, *Texas, *Rainfall-runoff relationships, Streamflow, Gaging stations, Flood protection, Flood control, Retaining walls, Hydrographs.
Identifiers: *Little Elm Creek(Tex), *Trinity River basin(Tex).

This report, the fourteenth in a series of basic-data reports published annually for the Little Elm Creek, Texas study area, contains the rainfall, runoff, and storage data collected during the 1973 water year for the 75.5 sq mi area above the stream-gaging station Little Elm Creek near Aubrey. The investigation is scheduled to continue through a period of both above- and below- normal precipitation to define the various factors used in the analyses of rainfall-runoff relationships. There are 12 floodwater- retarding structures in the Little Elm Creek watershed upstream from the stream-gaging station Little Elm Creek near Celina. These structures have a combined capacity of 9,490 acre-ft below the emergency spillway and control runoff from 28.4 sq mi or 61 percent of the area above the Celina stream-gaging station. Four floodwater-retarding structures are located in the area between the Celina and Aubrey stream-gaging stations. The 16 floodwater-retarding structures have a combined capacity of 12,340 acre-ft below the emergency spillway and control runoff from 35 sq mi, or 47 percent of the area above the Aubrey stream-gaging station. The average rainfall during the 1973 water year was 49.66 in or 133 percent of the 17-year (1957-73) average of 37.25 in. for the area. Monthly rainfall totals ranged from 0.68 in in December to 8.20 in in September. (Woodard-USGS)
W76-01181

FLOODS IN EASTERN LAJAS VALLEY AND THE LOWER RIO LOCO BASIN SOUTHWESTERN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
K. G. Johnson.
Hydrologic Investigations Atlas HA-532, 1974. 1 sheet, 4 fig, 3 tab, 5 ref.

Descriptors: *Floods, *Flood profiles, *Floodplains, *Hydrologic data, *Puerto Rico, Maps, Hydrographs, Flood frequency, Flood data, Land use, Planning.
Identifiers: *Eastern Lajas Valley(PR), *Lower Rio Loco basin(PR).

Factual and interpretive information is provided for floods in eastern Lajas Valley and the lower Rio Loco basin in Puerto Rico. The land is devoted almost entirely to agriculture (mostly to the production of surgarcane). Occasional tropical storms and hurricanes can produce torrential rains, which usually cause flooding. Parts of the study area have been inundated extensively at least four times since the greatest known flood of September 13, 1928. Eighteen bridges are in the flood area. The water surface during the 1928 flood was above low beam on 12 of these bridges and 10 of the 12 bridges were inundated. Flood profiles were developed on the basis of elevations of floodmarks. (Woodard-USGS)
W76-01182

FLOODS IN LOMBARD QUADRANGLE, ILLINOIS,
Geological Survey, Champaign, Ill.
H. E. Allen, and V. J. May.
For sale by USGS, Reston, Va. 22092 Price $1.25 per set. Hydrologic Investigations Atlas HA-143, 1964 (reprinted 1975). 1 sheet, 7 fig.

Descriptors: *Floods, *Flood profiles, *Flood data, *Flood plains, *Illinois, Hydrologic data, Flood frequency, Maps, Hydrographs, Land use, Planning.
Identifiers: *Lombard quadrangle(Ill).

The approximate areas inundated by floods along streams in the Lombard 7 1/2-minute quadrangle in Illinois are delineated on a topographic map. Inundated areas are shown along Winfield Creek for the flood of May 1954; along Spring Brook, Meacham Creek, and East Branch Du Page River for the flood of October 1954; and along unnamed tributaries of East Branch Du Page River, Salt Creek tributary, and Klein Creek for the flood of September 1961. This study of hydrologic data should help to evaluate the depth and frequency of flooding that affect the economic development of flood plains. (Woodard-USGS)
W76-01183

FLOODS IN THE CAROLINA-RIO GRANDE AREA, NORTHEASTERN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
W. J. Haire.
For sale USGS, Reston, Va 22092, Price $1.25. Hydrologic Investigations Atlas HA-533, 1975. 1 sheet, 7 fig, 4 tab, 7 ref.

Descriptors: *Floods, *Puerto Rico, *Flood profiles, *Flood data, Maps, Streamflow, Flow rates, Peak discharge, Flood frequency, Hydrographs.
Identifiers: *Carolina-Rio Grande area(PR).

This atlas provides hydrologic information on major floods in the Carolina-Rio Grande area, Puerto Rico. The data include tabulations of flood discharge and flood stage, flood profiles, and a map ofthe area inundated by the floods of September 6, 1960, and October 9, 1970. The areas of inundation and the flood profiles are specifically for conditions that existed at the time of the floods. A tabulation of flood-frequency data is presented for selected sites. The peak discharge of Rio Grande de Loiza at Loiza Dam was 170,000 cfs in 1960; for the 1970 flood it was 146,000 cfs. Upstream at the Caguas gaging station peak discharge was 71,500 cfs in 1960 and 62,800 cfs in 1970. (Woodard-USGS)
W76-01185

MAP SHOWING FLOOD-PRONE AREAS, GREATER DENVER AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
J. F. McCain, and W. R. Hotchkiss.
For sale USGS, Reston, Va 22092, Price $0.75. Miscellaneous Investigations Series Map I-856-D, 1975. 1 sheet, 1 map, 21 ref.

Descriptors: *Flood plains, *Maps, *Urbanization, *Flood protection, *Colorado, Flood frequency, Land development, Land use, Streamflow, Flow characteristics, Hydrologic data, Flood plain zon Watershed management.
Identifiers: *Greater Denver area(Colo).

The rapid growth of population in the Front Range Urban Corridor of Colorado is causing intense competition for available land resources. One form of competition posing serious problems is indiscriminate development of flood plains along creeks and rivers. This map depicts a broad-scale view of flood-prone areas along principal streams in the Greater Denver area of the urban corridor. Flood-prone areas identified are subject to inundation by the 100-year flood--a flood having a 1 percent chance of being equaled or exceeded in any given year. The magnitude and depth of this reference flood were derived for streams in the study area from streamflow records and reports of the U.S. Geological Survey, reports of the U.S. Army Corps of Engineers, and from reports prepared by various consulting engineering firms for the Urban Drainage and Flood Control District. (Woodard-USGS)
W76-01186

MAP SHOWING FLOOD OF APRIL 1975 AT EAST LANSING, MICHIGAN,
Geological Survey, Lansing, Mich.
R. L. Knutilla, and L. A. Swallow.
Open-file map, 1975. 1 sheet, 8 fig, 2 tab.

Descriptors: *Floods, *Maps, *Flood data, *Streamflow, *Michigan, Flow measurement, Discharge(Water), Flood damage, Aerial photography, Hydrographs, Flood peak, Peak discharge, Flood frequency, Sediment transport, Hydrologic data, Rainfall, Smowmelt.
Identifiers: *East Lansing flood April 1975, *Red Cedar River(Mich).

This is one of a series of map reports on the April 1975 flood in the Lansing, Michigan metropolitan area. The drainage area of the Red Cedar River at East Lansing is 355 square miles. About two weeks prior to the flood a heavy snow fell over most of the Red Cedar River basin. As much as 13 inches were recorded at some places. Subsequent melting increased streamflow. The extent of flooding along the Red Cedar River is shown on a photomosaic base map. A discharge hydrograph for the Red Cedar River at East Lansing shows the peak discharge of 5,940 cfs which occurred near midnight on April 20. This discharge is equivalent to a runoff of about 16.7 cfs per square mile of drainage area. A maximum sediment concentration of about 350 mg/litre at the gaging station on the Red Cedar River at East Lansing occurred on April 20; peak concentrations occurred several hours prior to the time of peak discharge. During the April 19-24 period, an estimated 11,500 tons of suspended sediment passed the gaging station. The flood has a recurrence interval of about 40 years, or about 2.5 percent chance of occurrence in any year. (Woodard-USGS)
W76-01188

MAP SHOWING FLOOD OF APRIL 1975, LANSING, MICHIGAN,
Geological Survey, Lansing, Mich.
J. B. Miller, and L. A. Swallow.
Open-file map, 1975. 2 sheets, 14 fig, 3 tab.

Descriptors: *Floods, *Maps, *Flood data, *Michigan, *Streamflow, Flow measurement, Discharge(Water), Flood damage, Aerial photography, Hydrographs, Flood peak, Peak discharge, Flood frequency, Sediment transport, Hydrologic data, Rainfall, Snowmelt.
Identifiers: *Lansing flood April 1975(Mich).

Discharge data for the flood of April 1975 in the Lansing, Mich., area were obtained on the Grand River at Lansing, Red Cedar River at East Lansing, Sycamore Creek near Holt, Mud Lake Drain near Lansing, and Carrier Creek near Lansing. Discharge hydrographs for these gaging stations are shown. The peak discharge of 11,200 cfs occurred on the Grand River at 6 p. m. on April 20. This discharge is equivalent to a runoff of 9.11 cfs per square mile of drainage area. The extent of flooding along the Grand River and the lower reaches of the Red Cedar River is shown on photomosaic base maps. Maximum sediment concentrations on the Grand River at the gaging station at Lansing were 300 to 350 mg/litre on April 19 and 20; peak sediment concentrations occurred several hours prior to the time of peak flow. During the April 19-24 period, an estimated 26,000 tons of suspended sediment passed the gaging station. The flood had a recurrence interval of slightly more than 10 years, or about a 10 percent chance of occurrence in any year. (Woodard-USGS)
W76-01189

MAP SHOWING FLOOD OF APRIL 1975 AT WILLIAMSTON, MICHIGAN,
Geological Survey, Lansing, Mich.
R. L. Knutilla, and L. A. Swallow.
Open-file map, 1975. 1 sheet, 9 fig, 1 tab.

Descriptors: *Floods, *Maps, *Flood data, *Michigan, *Streamflow, Flow measurement, Discharge(Water), Flood damage, Aerial photography, Flood peak, Peak discharge, Snowmelt, Flood frequency, Rainfall, Hydrologic data.
Identifiers: *Williamston(Mich), *Red Cedar River(Mich).

On April 18, 1975 the city of Williamston, Mich., experienced an intense rain storm that caused the Red Cedar River and the many small streams in the area to overflow their banks and resulted in the most devastating flood since at least 1904. Local officials estimated a loss of $775,000 in property damage. The extent of flooding along the Red Cedar River and Deer Creek is shown on the photomosaic base maps. The drainage area of Red Cedar River at Williamston is about 240 square miles. During the 7-hour duration of the April 18 storm, Williamston received 4.89 inches of rain. Precipitation of that intensity can be expected to occur only about once every 100 years on the average. At the time of the storm, streamflow was relatively high as a result of snowmelt from a heavy snowfall that had occurred 2 weeks earlier. The peak discharge at East Lansing was 5,940 cfs or 17 cfs per square mile. Runoff of Deer and Sloan Creeks was appreciably higher than for the Red Cedar at Williamston. (Woodard-USGS)
W76-01190

THE HYDROLOGY OF GLACIERS,
British Columbia Univ., Vancouver. Dept. of Geology.
For primary bibliographic entry see Field 2C.
W76-01246

HYDROLOGY OF GLACIERIZED BASINS--SUMMARY OF RESEARCH BY GLACIOLOGY SUBDIVISION,
Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 2C.
W76-01247

DIMENSIONLESS INLET HYDROGRAPH MODEL,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-01256

MEANDERING OF SUPRAGLACIAL MELT STREAMS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
G. Parker.
Water Resources Research, Vol 11, No 4, p 551-552, August 1975. 2 fig, 4 ref.

Descriptors: *Geomorphology, *Meanders, *Glaciohydrology, Streams, Channels, Melt water, Melting, Freezing, Hydrodynamics, Heat transfer, Streamflow, Supercritical flow.
Identifiers: *Supraglacial melt streams.

During periods of glacial ablation, excess water often concentrates in supraglacial melt streams, which typically exhibit meandering. A stability analysis of straight supraglacial streams was carried out to determine the nature of meandering tendencies. Instability leading to meandering in the flow results from a combination of hydrodynamic and differential heating effects. The heat involved is apparently largely frictional. The analysis indicated that instability occurs only for supercritical flow and that the meander pattern does not migrate downstream. Meander wavelength was determined by channel width, depth, and Froude number. The results agreed with field observations. (Jess-ISWS)
W76-01261

WATER DECONTAMINATION THROUGH RAIN WATER TREATMENT IN STORM WATER RETENTION TANKS (ENTLASTUNG DER GEWASSER DUCH BEHANDLUNG DES

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REGENWASSERS IN REGENUEBERLAUFBECKEN),
K. Krauth.
Wasserwirtschaft, Vol 63, No 2, p 42-46, February, 1973. 12 fig, 2 tab, 6 ref.

Descriptors: *Storm water, *Retention, *Waste water treatment, Sewerage, Canals, Design criteria, Overflow, Nutrient removal, Flow duration.
Identifiers: Storm water retention tanks, Clarification.

Recently developed storm water retention tanks to prevent main canal overload through polluted water have a bottom discharge, one of several overload outlets, and whose efficiency depends on their position in the sewer system. Criteria involved in their design include oveerflow frequency and quantity, the amount of sediment discharged into the main canal, and sediment load conveyed for clarification. Other factors include the average annual sediment, the frequency and extent by which this average is exceeded, and the effect of removed undissolved matter, oxygen-consuming organic matter, and nitrogen and phosphorus-containing nutrients. It is suggested that maximum inflow and minimum detention time factors should be used in the sizing of storm water retention tanks for sewer systems having preliminary discharge facilities and with flow durations exceeding 15 minutes. (Sandoski-FIRL)
W76-01289

SPECIAL SOLUTIONS FOR NONLINEAR EROSION PROBLEMS,
Minnesota Univ., Minneapolis. School of Mathematics.
For primary bibliographic entry see Field 2J.
W76-01296

CALIFORNIA HIGH WATER, 1972-1973,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
W. A. Arvola, J. S. Bartok, W. B. Chan, J. C. Bringham, and G. W. Patrick.
Available from California Dept. of Water Resources, Sacremento, 95802, for $2.00. Bulletin No 69-73, December 1974. 34 p, 6 fig, 1 tab, 2 append.

Descriptors: *Floods, *California, *Flooding, *Mudflows, *Storms, *Storm runoff, Runoff, Drainage, Rainfall, Excessive precipitation, Streamflow, Weather patterns, Tides, Winds, Flood stages, Hydrographs, Hydrology, Precipitation(Atmospheric), Peak discharge, Flood damage, Disasters.

The weather patterns of the 1972-73 flood season in California were characterized by a southerly displacement of the storm track which produced above-normal rainfall through the midcoastal and Central Valley areas of the state. This precipitation produced no significant flooding by any of the state's major streams; however, the combination of abundant and high-intensity rainfall caused local floods and mudslides so large and numerous that ten counties and one city were declared disaster areas during the season. The bulletin, 11th in an annual series, covered the period from October 1, 1972 through September 30, 1973, and described precipitation, runoff, flooding and the general weather patterns that preceded and coincided with storm periods. Also included were tabulations of precipitation comparisons and peak streamflows and stages, hydrographs of streamflow and reservoir operations, and weir overflow graphs. (Robinson-ISWS)
W76-01315

FLOOD OF JUNE 1972 IN THE SOUTHERN PEACE (SMOKY RIVER) BASIN, ALBERTA,
Department of the Environment, Calgary (Alberta). Water Resources Branch.
L. A. Warner, and W. C. Thompson.
Technical Bulletin No 87, 1974. 51 p, 16 fig, 8 plates, 3 tab, 4 ref, 3 append.

Descriptors: *Floods, *Flood damage, *Canada, Flood stages, Streams, Inflow, Rivers, Hydrographs, Precipitation(Atmospheric), Stream gages, Discharge(Water), Streamflow, Ice jams, Peak discharge.
Identifiers: *Peace River, *Alberta, Flood hydrographs, Maximum discharges, Agricultural damage.

Record flows in nearly all streams of the Peace River basin southwest of Grand Prairie followed more than 6 inches of rain in June 1972. Flood damage was reported in Grande Prairie, Grande Cache, Watino, and the town of Peace River. Calculations indicated that the influence of the W.A.C. Bennett Dam and diking operation in the town probably reduced the severity of flooding at Peace River townsite. The effect of the diking operation on water levels associated with an ice jam in April 1973 was discussed in an appendix. Details on agricultural flood damage incurred by farmers along the Peace River system were excerpted from 'Flood Damage Estimation, June 1972, Athabasca, North Saskatchewan and Peace River Basins' by J.L. Knapp, Alberta Department of Agriculture. Flood waters of the Smoky and Peace Rivers combined at Peace River townsite to produce a discharge of 550,000 cfs. The report gave a description of the flood, including meteorological analysis, flood hydrographs, and maximum discharges. Flood frequency analyses for two gage sites were presented. Hourly discharges were given for 7 sites and peak flows for two sites. (Roberts-ISWS)
W76-01316

MORPHOLOGY OF AN ARCTIC RIVER BAR,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W76-01319

MISSISSIPPI RIVER MOUTH PROCESSES: EFFLUENT DYNAMICS AND MORPHOLOGIC DEVELOPMENT,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W76-01321

SPECIAL FLOOD HAZARD REPORT: CAMPBELL CREEK, GREATER ANCHORAGE AREA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-01361

FLOOD PLAIN INFORMATION: ALISO CREEK, ORANGE COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-01362

SPECIAL FLOOD HAZARD INFORMATION: BEAR AND EVANS CREEKS, REDMOND AND VICINITY, WASHINGTON.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W76-01363

FLOOD PLAIN INFORMATION: EIGHT MILE CREEK, VICINITY OF PARAGOULD, ARKANSAS.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W76-01364

FLOOD PLAIN INFORMATION: PART I BAYOU BARTHOLOMEW AND TRIBUTARIES CITY OF PINE BLUFF, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-01365

SPECIAL FLOOD HAZARD INFORMATION WOLF LODGE CREEK AND TRIBUTARIES VICINITY OF COUER D'ALENE, IDAHO.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W76-01367

FLOOD PLAIN INFORMATION: POCOSHOCK AND POCOSHAM CREEKS, CITY OF RICHMOND AND CHESTERFIELD COUNTY VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W76-01368

FLOOD PLAIN INFORMATION: CASPER WYOMING, VOLUME III, NORTH PLATTE RIVER.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-01369

FLOOD PLAIN INFORMATION: ST. JOE AND ST. MARIES RIVERS, CITY OF ST. MARIES AND VICINITY, IDAHO.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W76-01370

SPECIAL FLOOD HAZARD REPORT: TO REVISE FLOOD PLAIN INFORMATION METROPOLITAN REGION, DENVER COLORADO; VOLUME II: SAND, TOLL GATE AND LOWER CHERRY CREEKS, SOUTH PLATTE RIVER BASIN.
Army Engineer District, Omaho, Nebr.
For primary bibliographic entry see Field 4A.
W76-01371

FLOOD PLAIN INFORMATION: PROCTORS CREEK, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W76-01372

FLOOD PLAIN INFORMATION: SAN LORENZO RIVER, BOULDER CREEK-FELTON, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-01373

FLOOD PLAIN INFORMATION: APTOS, TROUT AND VALENCIA CREEKS, CITY OF APTOS, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-01374

FLOOD FREQUENCY DISTRIBUTION IN A CATCHMENT SUBJECT TO TWO RAINFALL PRODUCING MECHANISMS,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch.
For primary bibliographic entry see Field 2A.
W76-01425

FLOOD WATER ANALYSIS IN THE AREA OF THE TIDAL RIVER EIDER

(HOCHWASSERANALYSE IM RAUM DER BINNENEIDER),
E. Guevara-Perez, and U. Schendel.
Wasserwirtschaft, Vol 65, No 7/8, p 190-193, 1975. 1 fig, 4 tab, 14 ref.

Descriptors: *Storm water, *Rivers, *Flood forecasting, Floods, Mathematical models, Precipitation(Atmospheric), Data collections, Tidal streams.
Identifiers: Seasonal variations.

The probability of the occurrence of high water flows in the catchment area of the tidal river Eider (Schleswig-Holstein) was investigated by means of different distribution functions on the basis of observation data collected over eleven years. Three distribution functions: log normal distribution according to Galton; log Pearson type III distribution; and gamma distribution were found suitable for the forecasting of flood events. The occurrence of high water flows in the summer period is primarily determined by the precipitation two days and one day before the flood event, as well as on the day of the highest waters. The correlations between high water flow and the various parameters are less certain in the winter period, when high water flow is essentially influenced by the precipitation on the day preceding the event, by the water content of the ground, and by the precipitation on the day of the high water flow. (Takacs-FIRL)
W76-01428

PREDICTION OF THE EFFECTS OF THE FLOODWATER OF THE OLONA RIVER IN TICINO (PREVISIONI SUGLI EFFETTI DELLA IMMISSIONS DELLE ACQUE DI PIENE DELL' OLONA IN TICINO),
For primary bibliographic entry see Field 4A.
W76-01447

LONG- AND SHORT-TERM FORECASTING OF RIVER DISCHARGE, (IN JAPANESE),
For primary bibliographic entry see Field 4A.
W76-01454

CALIFORNIA HIGH WATER, 1973-1974,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
W. A. Arvola, J. S. Bartok, W. B. Chan, J. C. Bringham, and G. W. Patrick.
Available from the Calif Dept of Water Resources, Sacramento, Calif, 95802 for $3.00. Bulletin No 69-74, November 1974. 67 p, 23 fig, 2 tab, 3 append.

Descriptors: *Floods, *Flooding, *California, *Water year, *Storms, Storm runoff, Runoff, Rainfall, Weather patterns, Precipitation(Atmospheric), Streamflows, Flood stages, Hydrographs, Flood damage, Hydrology, Reservoirs, Drainage.
Identifiers: High water events.

Water year 1973-74 in California was wet, especially in the northern part of the state. The wet season included two major storms that caused extensive flooding in several basins in the North Coastal Hydrographic Area, and in the Sacramento River basin of the Central Valley Hydrographic Area. The first major flooding occurred in mid-January 1974; the second occurred at the end of March 1974. The bulletin, 12th in an annual series of reports on high water events in California, presented information on flooded areas and storm-related damage during the water year (October 1, 1973-September 30, 1974). It described the general weather patterns preceding and during significant storm periods, the precipitation characteristics of these storms, and the resulting runoff. Also included were tabulations of precipitation comparisons, peak streamflows and stages, hydrographs of stream stages and reservoir operations, weir overflow graphs, and a description of general weather patterns significant to storms affecting California. (Robison-ISWS)
W76-01482

STILLWATER RIVER AND ROSEBUD CREEK FLOOD HAZARD ANALYSES, STILLWATER COUNTY, MONTANA.
Soil Conservation Service, Bozeman, Mont.
Report, May 1974. 132 p, 2 fig, 11 plates, 17 maps, 3 append.

Descriptors: *Floods, *Flood frequency, *Flood recurrence interval, *Montana, Rivers, Streams, Streamflow, Maximum probable flood, Flood forecasting, Flood data, Maps, Flood protection, Flood control, Flood damage, Flood plains, Flood plain insurance, Flood profiles, Surface runoff, Design flood, Erosion, Sedimentation, Hydrology, Management.
Identifiers: *Stillwater River(Mont), *Rosebud Creek(Mont).

Flooding results in loss of property, creates health and safety hazards, and disrupts needed services. Flooding also results in high costs to welfare agencies and city, county, state, and federal governments to repair or replace roads, streets, and bridges; rescue and care for the stranded; protect private property; clean up debris; and restore services. Knowledge of potential flood hazard, as presented in the report, is the basis of properly administering a flood plain management program to minimize these costs. The report contained sixteen aerial photomaps showing the 100-year frequency flood lines along a portion of the Stillwater River and Rosebud Creek. The photomaps also showed soils information. Water surface profiles, soils interpretations, flood photographs, and other related flood plain data were included. The 10-, 25-, 50-, 100-, and 500-year frequency floods were analyzed. Only the 100-year flood lines were shown on the aerial photomaps and water surface profiles. Information for the 10-, 25-, 50-, 100-, and 500-year floods was in an appendix. Elevations for other frequency storms can be determined from the basic support data on file with the Soil Conservation Service. (Sims-ISWS)
W76-01483

2F. Groundwater

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W76-01031

PROCEDURES FOR THE OPTIMUM USE OF GEOPHYSICAL METHODS IN GROUNDWATER DEVELOPMENT PROGRAMS,
Pretoria (Sou. Africa). National Physical Research Lab.
P. F. Worthington.
Bulletin of the Association of Engineering Geologists, Vol 12, No 1, p 23-38, 1975. 27 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Borehole geophysics, *Resistivity, *Geophysics, *Aquifer testing, Exploration, Subsurface mapping, Surveys, Aquifers, Groundwater, Groundwater basins, Water sources, Water wells, Groundwater resources, Groundwater mining, Overdraft, Groundwater movement, Permeability, Porosity, Rock properties, Transmissivity, Water quality.

An appraisal is made of the role of geophysics in groundwater exploration and development, and the pertinent geophysical techniques and different hydrologic regimes to which they may be usefully applied are described. First the water-transmitting properties of the aquifer should be established; these are defined as either granular, or fractured, fissured, jointed or cavernous. The laternal extent of the aquifer should then be delineated and promising areas for well yield are approximated from observation well data. In mapping secondary aquifers the problem generally reduces to structural mapping of the aquifer and adjacent formations, whereas in hydrogeophysical mapping of primary aquifers the problem is one of delineating variations in those parameters which control groundwater quality and availability. Two potential problems can occur once development of an aquifer has taken place: overpumping resulting in declining water levels, and contamination if saline intrusion or the influx of polluted waters is induced. Both problems can be monitored by geophysical methods. (Robinett-Arizona)
W76-01125

GALERKIN FINITE-ELEMENT SIMULATION OF A GEOTHERMAL RESERVOIR,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 1A.
W76-01179

GEOHYDROLOGY AND WATER QUALITY OF THE MISSISSIPPI RIVER ALLUVIAL AQUIFER, NORTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
M. S. Whitfield, Jr.
Louisiana Department of Public Works, Water Resources Technical Report No 10, 1975. 29 p, 4 fig, 8 plate, 1 tab, 19 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Water quality, *Louisiana, *Mississippi River basin, Alluvial aquifers, Aquifer characteristics, Groundwater movement, Water wells, Well data, Pumping, Water yield, Transmissivity, Hydraulic conductivity, Storage coefficient, Groundwater recharge, Water supply, Chemical analysis.
Identifiers: *Northeastern Louisiana.

The Mississippi River alluvial aquifer in northeastern Louisiana is in the alluvium of the Mississippi, Arkansas, and Ouachita Rivers and underlies approximately 5,000 sq mi in the Mississippi River valley. The aquifer, of Pleistocene age, is a southeastward-thickening wedge of sand and gravel that ranges in thickness from about 20 to 135 feet. Fine sand, silt, and clay of Holocene age overlie and generally confine the aquifer. These fine-grained deposits range in thickness from 0 to 100 feet but generally do not exceed 40 feet. Water levels in the aquifer generally are less than 30 feet below land surface. The aquifer can yield water in sufficient quantity for most uses. The transmissivity ranges from 13,000 to 45,000 feet squared per day. The hydraulic conductivity ranges from 130 to 530 feet per day. Storage coefficients range from 0.001 to 0.05. Large-diameter wells yield as much as 7,000 gpm near Tallulah in Madison Parish. The quality of water varies areally and with depth, but generally the water is hard to very hard and high in iron concentration. Where fresh, the water typically is a calcium bicarbonate type generally ranging in hardness from 200 to 600 mg/litre. (Woodard-USGS)
W76-01180

HYDROGEOLOGY ALONG THE PROPOSED BARRIER-RECHARGE-WELL ALINEMENT IN SOUTHERN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N. Y.
For primary bibliographic entry see Field 4B.
W76-01184

LAND SUBSIDENCE DUE TO GROUNDWATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA: PART 1.CHANGES IN THE HYDROLOGIC ENVIRONMENT CONDUCTIVE TO SUBSIDENCE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-01192

LIBRARY U. OF I. URBANA-CHAMPAIGN

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: I. SEASONAL FLUCTUATIONS IN THE HEIGHT OF THE GROUND WATER TABLE,
Institute for Agricultural Research, Zaria (Nigeria).
J. Kowal, and A. O. Omolokun.
Samaru Res Bull. 149 p, 27-40. 1972. Illus.

Descriptors: *Watershed(Basins), Hydrology, Water table, Rainfall, Groundwater, *Seasonal, *Fluctuations.
Identifiers: Catchment basins, Nigeria, Production, Rainfall, Samaru, Seasonal, Small, Soil, Storage, Table, Water, Zaria, Nigeria.

Fluctuations of the water-table in a small catchment area at Samaru, Zaria, were studied. The water-table of the catchment basin occurs at various depths in relation to topography but can be described in terms of gradients in respect to topographical slope or a convenient horizontal datum (e. g., lake surface of full capacity). The dry season water-table occurs at a relatively shallow depth. The gradient of the dry season water-table restricts the water storage capacity of the soil profile, and in wet years not all the rainfall can be accepted. There is a considerable surplus of rainfall over evapo-transpiration demands lasting from July till the end of rains in Oct., resulting in the rise of water-table gradients. The rise in the dry season water table occurs when cumulative rainfall is about 18 in., which is usually in July. During wet years 40% of the catchment area has a water table at less than 5 ft depth when the rains end, and this may adversely affect crop production. With the present cropping patterns and the prevailing soil and climatic conditions, water conservation measures such as tired ridges cannot benefit crop production. The amount of ground water temporarily stored in the soil profile above the dry season water table and lost in seepage is between 10-14% of the total water budget of the catchment basin.--Copyright (c) 1974, Biological Abstracts, Inc.
W76-01230

UNDERGROUND STORAGE OF TREATED WATER: A FIELD TEST,
C. G. Smith, Jr., and J. S. Hanor.
Ground Water Vol 13, No 5, p 410-417, September-October 1975. 4 fig, 2 tab, 12 ref.

Descriptors: *Groundwater, *Water sources, *Water supply, *Underground storage, *Water storage, *Louisiana, Unconsolidated aquifers, Groundwater movement, Recharge, Supply, Wells, Pumped storage, Storage capacity, Water demand, Water shortage, Injection, On-site tests, Model studies, Sand aquifers, Injection wells.
Identifiers: *Injection-storage-production process, *Treated water storage, *Recovery efficiency, Groundwater quality, Marine sands, Deltaic sands.

Successful underground storage of large volumes of treated water (sufficient for a period of weeks or months) could provide a temporary, alternative water supply in areas where potable groundwater is not available and where surface runoff varies unpredictably in quantity and quality. A small-scale field test of underground storage, using an injection well, was performed in Jefferson Parish, Louisiana. Storage in the tested aquifer was impractical due to the pre-existing groundwater movement rate of 0.5 ft per day. A mathematical model of the injection-storage-production process accurately predicted the recovery efficiencies observed in the two tests. The quantity of injected water was not adversely affected by geochemical reactions occurring during the tests. The injected water was softened during storage by ion-exchange reactions between injected water and clay particles in the aquifer. (Sanderson-ISWS)
W76-01253

BACTERIAL FLORA OF SALINE AQUIFERS,
North Carolina State Univ., Raleigh. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W76-01254

WATER RESOURCES OF VOLCANIC ISLANDS, A PILOT PROJECT IN THE CANARIES,
For primary bibliographic entry see Field 2A.
W76-01258

LIMITATIONS OF THE ELECTRICAL RESISTIVITY METHOD IN LANDFILL INVESTIGATIONS,
For primary bibliographic entry see Field 5B.
W76-01268

HYDROGEOLOGY OF A PORTION OF THE SAND HILLS AND OGALLALA AQUIFER, SOUTH DAKOTA AND NEBRASKA,
South Dakota School of Mines and Technology, Rapid City.
P. H. Rahn, and H. A. Paul.
Ground Water, Vol 13, No 5, p 428-437, September-October 1975. 10 fig, 2 tab, 15 ref.

Descriptors: *Hydrogeology, *Groundwater, *Aquifer testing, *Water table aquifers, *South Dakota, *Nebraska, *Groundwater recharge, Water quality, Recharge, Aquifer characteristics, Unsteady flow, Transmissivity, Hydraulic conductivity, Natural recharge, Storage coefficient, Drawdown, Water yield.
Identifiers: *Ogallala aquifer, Delayed yield, Type curve analysis, Well testing.

The Pliocene Ogallala Formation and the Quaternary Sand Hills Formation cover an extensive area in the northcentral prairie states. The area studied in this investigation included onlt that portion between the Little White River, South Dakota, and the Niobrara River, Nebraska, where the saturated thickness is about 100 feet. A five-day aquifer test showed that the coefficient of permeability is 439 gpd/sq ft. The water had total dissolved solids contents of only 90 ppm. An average of 18 inches of precipitation falls on this arid country annually, and the average annual recharge to these permeable deposits was calculated at 2 to 3 inches. Little groundwater development has occurred in the area to date, but the aquifer has considerable potential. The aquifer is exceptionally permeable, close to the surface, and easy to drill, and has exceptionally good recharge and good quality water. Data on recharge rates and theoretical distance-drawdown curves supported the conclusion that irrigation of more than 1 quarter-section for every 2 sections of land would cause a depletion of the aquifer. (Pricket-ISWS)
W76-01299

STEP-DRAWDOWN TEST ANALYSIS BY COMPUTER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-01300

2G. Water In Soils

STEADY INFILTRATION FROM LINE SOURCES BURIED IN SOIL,
Department of Agriculture, Watkinsville.
For primary bibliographic entry see Field 3F.
W76-01065

REMOTE SENSING TECHNIQUES FOR EVALUATION OF SOIL WATER CONDITIONS,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 7B.
W76-01067

SOIL SALINITY DISTRIBUTION IN SPRINKLER AND SUBSURFACE-IRRIGATED CITRUS,
Brigham Young Univ., Provo, Utah
For primary bibliographic entry see Field 4B
W76-01074

THE EFFECT OF SOIL WATER SUPPLY ON CORN FERTILIZER RESPONSE,
Agricultural Research Service, Morris, Minnesota.
For primary bibliographic entry see Field 3F.
W76-01075

HIGH ELECTROLYTE WATER FOR RECLAIMING SLOWLY PERMEABLE SOILS,
Texas A and M Univ., College Station.
M. A. Rahman, E. A. Hiler, and J. R. Runkles.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 1, p 129-132, January-February 1974. 7 fig, 2 tab, 11 ref.

Descriptors: *Infiltration, *Infiltration rates, *Hydraulic conductivity, Electrolytes, Soil investigations, Soil management, Soil physical properties, Soil treatment, Soil water movement, Permeability, Agriculture, Analysis, Reclamation, Alkaline soils.
Identifiers: *Soil reclamation.

Reclamation processes in a slowly permeable, mildly sodic, low electrolyte, humid soil were studied using different ionic compositions and concentrations of electrolyte waters. The method utilized for this soil consisted of increasing soil hydraulic conductivity with additions in increasing concentration of electrolyte water and then leaching out salts with decreasing concentrations while maintaining the increased hydraulic conductivity. Electrolyte waters applied in increasing followed by decreasing concentrations were utilized successfully for reclaiming this soil. The soil intake rates and hydraulic conductivities were increased very substantially. Further applied research and field trials with similar soils seem justified based on the findings. (Skogerboe-Colorado State)
W76-01077

SOIL TEMPERATURE MODELING USING AIR TEMPERATURE AS A DRIVING MECHANISM,
Wyoming Univ., Laramie. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-01079

MODELING INFILTRATION AND REDISTRIBUTION OF SOIL WATER DURING INTERMITTENT APPLICATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
L. G. James, and C. L. Larson.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois Paper No 74-2571 American Society of Agricultural Engineers, St. Joseph, Michigan. 26 p, 17 fig, 2 tab, 22 ref.

Descriptors: *Model studies, *Computer models, *Infiltration, Soil water, Soil water movement, Wetting, Infiltration rates, Capillary action, Runoff, Irrigation, *Forecasting.

A model based on equations that use measured physical parameters to represent the infiltration and redistribution of soil water during intermittent water applications with reasonable simplicity and accuracy is needed. A computer model combining the work of other researchers was developed to fulfill this need. Inputs required by the model include the soil's saturated conductivity and moisture content, its approximate conductivity-

moisture content and conductivity-capillary pressure relationships, its initial moisture content as well as the distance from the soils' surface to its lower boundary. Model output includes the depths and moisture contents of both primary and secondary wetting fronts, the rates of infiltration, surface and subsurface supply as well as the total volume of water applied, infiltrated and supplied to surface and subsurface runoff. Experimental laboratory data for a graded silica sand was collected and compared to model predictions. Results presented indicate that the model does an excellent job of predicting the volume of water stored in the soil zone as well as the times when surface and subsurface runoff begin. It also gives excellent predictions of infiltration rate and surface and subsurface runoff supply rates when the application rate is less than or equal to the soils' saturated conductivity. (Skogerboe-Colorado State)
W76-01085

SOIL WATER,
Agricultural Research Service, Columbia, Mo. North Central Region.
C. R. Amerman, A. Klute, R. W. Skaggs, and R. E. Smith.
Reviews of Geophysics and Space Physics, Vol 13, No 3, p 451-454, 496-504, July, 1975, 556 ref.

Descriptors: *Soil water, *Soil water movement, *Unsaturated flow, *Hydraulic properties, *Hydraulic conductivity, Drainage effects, Infiltration, Leaching, Soil physics, Moisture tension, Permeability, Soil types, Storage capcity, Moisture, Porosity, Soil moisture, Soil physical properties, Soil properties, Flow, Saturated flow, Measurement, Equations, Bibliographies.
Identifiers: Soil hydraulic properties.

Recent advances in developing methods to solve the equations governing combined saturated-unsaturated flow in 2 and 3 dimensions have focused attention on the need to determine effective field values of the hydraulic properties of the soil. Work done in this field to determine the field variability of soil hydraulic properties and to test various field methods of measuring these properties is discussed. Subjects include: methods for calculating the hydraulic conductivity from the soil water characteristics, thermal and osmotic effects on soil water movement, and transport equations of nitrogen movement during leaching of unsaturated soils. (Robinett-Arizona)
W76-01111

THE EFFECT OF TEXTURE STRATIFICATION ON SALT ACCUMULATION IN AN ARID LAND SOIL,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2K.
W76-01112

THE UTILITY OF SURFACE TEMPERATURE MEASUREMENTS FOR THE REMOTE SENSING OF SURFACE SOIL WATER STATUS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, T. J. Schmugge, R. D. Jackson, and R. J. Reginato.
Journal of Geophysical Research, Vol 80, No 21, p 3044-1049, July, 1975. 8 fig, 9 ref.

Descriptors: *Soil temperature, *Soil surfaces, *Soil moisture, *Remote sensing, Moisture tension, Arizona, Topsoil, Soil physics, Soil water, Semiarid climates, Moisture content, Soil physical properties, Thermal properties, Air temperature, Diurnal, Soil types.

Experiments on Avondale loam soil indicate that remote sensing of surface soil temperature may provide a practical means of assessing soil water status in the uppermost few centimeters of bare soil. The volumetric water contents of surface soil layers between 2 and 4 cm thick were found to be linear functions of the amplitude of the diurnal surface soil temperature wave for clear day-night periods and also linear functions of the daily maximum value of the surface soil-air temperature differential. If the soil type is unknown, water content per se cannot be determined, but fair estimates of soil water pressure potential can be obtained. (Robinett-Arizona)
W76-01121

EFFECT OF SULFURIC ACID ON WATER MOVEMENT IN CALCAREOUS SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.
W76-01124

PERCOLATION TESTS FOR SEPTIC TANK SUITABILITY OF TYPICAL SOUTHERN ARIZONA SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
K. A. Barbarick.
Master of Science Thesis, 1975. 72 p, 12 fig, 7 tab, 2 append, 41 ref.

Descriptors: *Percolation, *Septic tanks, *Sewage disposal, *Soil disposal fields, *Pervious soils, Arizona, Percolating water, Penetration, Porosity, Seepage, Soil types, Silts, Clay, Permeability, Infiltration, Soil water movement, Mathematical studies, Model studies, Flow rates, Flow measurements.

The percolation rates of nine typical southern Arizona soils were measured and found to vary from 1.75 to 21.5 cm/hr. Use of linear regression demonstrated a significant linear relationship between the test hole diameter and percolation rate, and correlation was found to exist between the percent of sand and clay in the subsoil and precolation rate. The percent of silt in the subsoil was also a factor in rate determination. A technique utilizing existing mathematical theories to simulate flow from cylindrical holes or absorption trenches in order to relate percolation rate to actual flow rates in absorption trenches was established but need improvement. Mathematical modeling does, however, provide potential for comparing percolation rates to expected flow rates. (McLachlan-Arizona)
W76-01128

CONTAINMENT AREA FACILITY CONCEPTS FOR DREDGED MATERIAL SEPARATION, DRYING, AND REHANDLING,
Hittman Associates, Inc., Columbia, Md.
C. W. Mallory, and M. A. Nawrocki.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-002 605, $9.00 in paper copy, $2.25 in microfiche. Oct. 31, 1974. 236 p, 57 fig, 58 tab, 2 append.

Descriptors: *Dredging, *Sands, *Gravels, Reclamation, Spoil banks, Water pollution sources, Construction materials, Costs, Solid wastes, Bottom sampling, Desilting, Sludge disposal, Separation techniques, Soil engineering, Soil mechanics.

The separation of sand and gravel from dredged material is technically feasible using commercially available equipment employed by the sand and gravel and mineral processing industries. In most cases the cost of removing and processong the sand and gravel will be within the market value of materials normally produced. The removal of the sand and gravel will also reduce the required land area and storage volume of containment basins. (Witt-IPC)
W76-01220

SOIL WATER DEPLETION BY LODGEPOLE PINE ON GLACIAL TILL,
Intermountain Forest and Range Experiment Station, Ogden, Utah.
R. S. Johnston.
USDA Forest Service, Research Note INT-199, August, 1975. 8 p, 3 fig, 1 tab, 8 ref.

Descriptors: *Soil water, *Glacial soils, *Lodgepole pine trees, Clear-cutting, Water yield, Watershed management, Water resources, Groundwater availability.
Identifiers: Pinus contorta, Utah, Uinta Mountains(Utah).

Soil water depletion was measured on small paired plots of cut and uncut Pinus contorta. Neutron measurements were made to a depth of 3 m on two different soils of glacial origin. Soils on the cut plot contained from 3 to 11 cm more water than the adjacent uncut plot at the end of each summer after cutting. These changes in soil water were restricted to the surface 2 m of soil. The treatment effect should persist for several years, until deep-rooted vegetation is completely re-established on the site. (Witt-IPC)
W76-01221

MECHANICAL SNAKE RIVER UNDISTURBED SOIL CORE SAMPLER,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 7B.
W76-01272

ANALYTICAL SOLUTIONS TO THE ONE-DIMENSIONAL LINEARIZED MOISTURE FLOW EQUATION FOR ARBITRARY INPUT,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. W. Warrick.
Soil Science, Vol 120, No 2, p 79-84, August 1975. 2 fig, 2 tab, 12 ref, append.

Descriptors: *Equations, *Soil moisture, *Mathematical models, Infiltration, Percolation, Soil water movement, Diffusivity, Hydraulic conductivity, Gravitational water, Moisture content, Numerical analysis, Loam, Clay loam, Earth-water interfaces.
Identifiers: Linearized solution.

Analytical solutions to the one-dimensional, linearized moisture flow equation were presented. The surface boundary condition was taken either as a time-varying flux, time-varying water content, or with the flux as a linear function of the water content. A semi-infinite, vertical flow medium was considered with arbitrary initial conditions. Calculations for a cyclic flux input were compared to the associated nonlinear, finite difference solution for five simulations using data from two soils. The same general profiles were obtained. The solution was believed to have particular merit to describe moisture regimes resulting from a high frequency irrigation schedule. (Visocky-ISWS)
W76-01301

SIMULATION OF EVAPORATION FROM BARE SOIL UNDER STEADY AND DIURNALLY FLUCTUATING EVAPORATIVITY,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences and Texas Agricultural Extension Service, College Station.
For primary bibliographic entry see Field 2D.
W76-01302

TWO-DEMINSIONAL TRANSPORT OF SOLUTES DURING NONSTEADY INFILTRATION FROM A TRICKLE SOURCE,
Volcani Inst. of Agricultural Research, Bet Dagan (Israel).
E. Bresler.

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Soil Science Society of America Proceedings, Vol 39, No 4, p 604-613, July-August 1975. 3 fig, 15 ref, 1 append.

Descriptors: *Solutes, *Unsteady flow, *Diffusion, *Convection, *Infiltration, Mathematical models, Numerical analysis, Equations, Unsaturated flow, Salinity, Root zone, Darcys law, Soil moisture, Moisture content, Soil watedr movement, Soils, Loam, Sands, Evaporation.
Identifiers: *Plane flow, *Axisymmetric flow, Trickle flow.

A simulation model for analyzing multidimensional simultaneous transfer of a noninteracting solute and water, applicable to infiltration from a trickle source, was developed. The equations describing transient two-demensional transport of a solute by diffusion and convection in unsaturated porous media were solved numerically by an approach that eliminated the effect of numerical dispersion. The noniterative alternating-direction-implicit finite difference procedure was used. Two mathematical models were considered: (1) a plane flow model involving the Cartesian coordinates x and z, and (2) an axisymmetric flow model described by the cylindrical coordinates r and z. An example of transport in a homogeneous, isotropic and stable sand and loam soil systems was given. Results were shown for typical cases of trickle infiltration to demonstrate the effects of trickle discharge and soil-hydraulic properties on the pattern of salt distribution in the wetted soil zone. The numerical results showed that the approach presented may be useful in analyzing two-demensional solute transport processes in soils. (Visocky-ISWS)
W76-01303

TRANSFORMATIONS OF SWINE WASTE-WATER IN LABORATORY SOIL PROFILES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-01387

CONTACT MATERIALS FOR LABORATORY SOIL WATER STUDIES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
D. S. McIntyre, and C. L. Watson.
CSIRO Australia, Division of Soils Technical Paper No. 26, 1975. 11 p, 3 fig, 10 ref.

Descriptors: *Laboratory tests, *Soil moisture, *Moisture tension, Soil water movement, Soil structure, Soil surfaces, Moisture content, Measurement, Soil physical properties.
Identifiers: Suction plates, Pressure plates.

When wetting or draining structured soil material, particularly clods, on suction and pressure plates, interposal of a fine-grained material between sample and plate can be used to increase the efficiency of contact and hence the rate of transfer of water. The particle size range best suited to any given applied suction may be approximately determined using a theory of packing. It is found in most cases that material with a particle size range lying within the silt and fine sand fraction should suffice. Various materials - grinding powders, glass beads, diatomaceous earth and soil separates - were tested for moisture retention at suctions up to 10 bars. Overall the most readily prepared suitable material of those tested is a soil containing a high percentage of very stable aggregates in the size range 5 to 76 micrometers. At suctions less than 0.20 bar, diatomaceous earth is the most suitable of the materials tested. (CSIRO)
W76-01415

SIMULATION OF THE RAINFALL-RUNOFF PROCESS USING A HYSTERETIC INFILTRATION-REDISTRIBUTION MODEL,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-01421

GEOMORPHOLOGY OF A GLACIATED FIRST-ORDER VALLEY IN SOUTH CENTRAL NEW YORK,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W76-01469

A HYDROPHOBIC MEMBRANE PROBE FOR TOTAL PRESSURE AND PARTIAL PRESSURE MEASUREMENTS IN THE SOIL ATMOSPHERE,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
H. Fluhler, and H. P. Laser.
Soil Science, Vol 120, No 2, p 85-91, August 1975. 8 fig, 13 ref.

Descriptors: *Soil environment, *Soil moisture, *Pressure measuring instruments, *Infiltration, Soil investigations, Soil water movement, Atmospheric pressure, Diffusion, Pore pressure, Measurement, Simulated rainfall, Instrumentation, Pressure, Aeration, Air, On-site investigations.
Identifiers: *Soil atmosphere, *Hydrophobic membrane probe, Oxygen partial pressure, Soil aeration, Total air pressure.

For total air pressure and oxygen partial pressure measurements a hydrophobic membrane probe was used. The probe consisted of a small membrane-covered chamber and two teflon capillaries. The probe represented an artificial, permanently air-filled pore which connects the soil atmosphere at a certain depth with a pressure transducer or an oxygen electrode placed on the soil surface. The soil water was excluded from the artificial gas phase by a water-repellent membrane highly permeable to air. The hydrophobic membrane made the gaseous phase between soil and sensor continuous. This instrument was used in the field to follow changes in total air pressure and oxygen partial pressure in the soil atmosphere during water infiltration and drainage processes. The total pressure in the soil atmosphere and the partial pressure of its components strongly depend upon the continuity of the gaseous phase. This effect was shown in an undisturbed soil profile after a heavy artificial rainfall of 75 mm was applied with 2 hr. (Sanderson-ISWS)
W76-01480

2H. Lakes

WATER QUALITY AND PHYTOPLANKTON PRODUCTIVITY OF SUMMERSVILLE RESERVOIR,
West Virginia Univ., Morgantown. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-01143

PHYTOPLANKTON COMPOSITION OF A SMALL SUBARCTIC LAKE IN THE NORTHWEST TERRITORIES, CANADA,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-01157

GEOGRAPHY AND LAKE MORPHOMETRY OF THE AQUACULTURE STUDY AREAIN THE ERICKSON-ELPHINSTONE DISTRICT OF SOUTHWESTERN MANITOBA,
Fisheries and Marine Service, Ottawa (Ontario).
L. A. Sunde, and J. Barica.
Canada Fisheries and Marine Service, Research and Development Directorate Technical Report, No 510, 1975. 38 p, 5 fig, 8 tab, 13 ref, 1 append.

Descriptors: *Lake morphometry, *Geomorphology, *Climatic data, *Aquiculture, Fish farming, Canada, Shallow water, Land use, Precipitation(Atmospheric), Water temperature, Aquatic plants, Hydrologic aspects, Eutrophication, Winterkilling, Vegetation, Bathymetry, Potholes, Cold regions.
Identifiers: *Erickson-Elphinstone Dist.(Manitoba).

A systematic investigation was made of these shallow pothole lakes to determine their feasibility for commercial production of rainbow trout. The area is an undulating glacial till plain with underlying cretaceous shale of the Riding Mountain formation. Soils are 70% grey-black and 20% grey-wooded. Mean annual temperature is 1C with 85-110 frost-free days. Annual precipitation is 450-480 mm, snowfall 1140-1270 mm, potential evapotranspiration 525-550 mm, and mean moisture deficit about 100 mm. Grain and cattle are the principal resource bases. The land is 52% cultivated. Population density is about 3.5 people/sq km. Depressions between knolls and ridges are filled with marshes, sloughs, and pothole lakes. Because of the hummocky terrain and porous nature of unconsolidated glacial drift, surface drainage is local. Many lakes are landlocked with no surface inflow or outflow, very eutrophic, productive, shallow, and unstratified. Most winterkill and thus contain few native fish. Since 1968, 71 lakes have been experimentally stocked with rainbow trout with encouraging results. The lakes' area and depth frequency distribution is described. Bathymetric charts of 16 lakes are presented. These lakes are representative of hundreds of thousands of similar winterkill lakes in the Canadian prairies that are potentially suitable for fish farming. (Buchanan-Davidson--Wisconsin)
W76-01166

NUTRIENT AND PHYTOPLANKTON STUDIES OF LLANGORSE LAKE, A EUTROPHIC LAKE IN THE BRECON BEACONS NATIONAL PARK, WALES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-01167

CHANGE IN PLANKTONIC COMPLEXES IN THE EUTROPHIC LAKE BALTYM DUE TO OVERGROWTH BY WEED,
Ural and Siberian Fishery Scientific-Research and Planning Inst. Sverdlovsk (USSR).
For primary bibliographic entry see Field 5C.
W76-01172

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. XII. NUMBERS AND BIOMASS OF THE FAUNA ASSOCIATED WITH MACROPHYTES,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
E. Pieczynski.
Ekologia Polska, Vol 21, No 88, p 597-609, 1973. 4 fig, 5 tab, 50 ref.

Descriptors: *Fish stocking, *Grazing, *Aquatic plants, *Fish food organisms, Benthic fauna, Diptera, Invertebrates, Plant groupings, Animal groupings, Oligochaetes, Mayflies.
Identifiers: *Lake Warniak(Poland), Elodea canadensis, Stratiotes aloides.

Studies were made in Poland to estimate the food resources of the vegetation zone for fish and to study the effects of fish grazing on the invertebrate fauna associated with macrophytes. The number, biomass, and composition of fauna associated with two species of macrophytes found in distinctly monospecific aggregations were analyzed. More fauna were found on Elodea canadensis (water-weed) that on Stratiotes aloides (water-soldier), but the biomass of fauna and

number of components was lower. Numbers of Chironomidae, Oligochaeta, and Ephemeroptera and the biomass of Chironomidae and Ephemeroptera were high on Elodea. Numbers of Chironomidae and the biomass of Chironomidae, Hirudinea, and Lepidoptera were high on Stratiotes. Numbers and biomass were lower in comparison to the control portion of the lake which had an increased fish stock. Decreases in Chironomidae biomass were greater than changes in numbers; similar changes were observed in other fauna groups which could be used as fish food. Individual chironomids were lighter in the stocked part of the lake. These results appeared to be caused by fish grazing. (Buchanan-Davidson--Wisconsin)
W76-01174

SURFACE SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN--VOLUME 3. OHIO RIVER BASIN FROM LOUISVILLE, KENTUCKY, TO WABASH RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-01177

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 1.' NORTH ATLANTIC SLOPE BASINS--VOLUME 1. BASINS FROM MAINE TO CONNECTICUT.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-01178

HEAVY-METAL TOLERANCE IN ALGAE FROM CONTAMINATED LAKES NEAR SUDBURY, ONTARIO,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-01197

STUDIES ON THE DECOMPOSITION OF A DUCKWEED (LAMNACEAE) COMMUNITY,
Allegheny Coll., Meadville, Pa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-01198

A STUDY OF THE OZARK HELLBENDER CRYPTOBRANCHUS ALLEGANIENSIS BISHOPI,
Milwaukee Public Museum, Wis. Vertebrate Div.
J. A. Nickerson, and C. E. Mays.
Ecology. Vol 54, No 5, p 1164-1165. 1973. Illus.

Descriptors: *Salamanders, Animal populations, Biomass, Density.
Identifiers: Cryptobranchus Alleganiensis.

A tag-recapture study of the Ozark Hellbender salamander, C. alleganiensis bishopi, was made on the North Fork of the White River, Ozark Co., Missouri (USA). During the summers of 1969 and 1970, animals were tagged along a 2.67-km stretch of stream bed. Population estimates were 428 with 95% confidence level (CL) of 341-573 hellbenders/km of stream bed. Biomass estimates were 156 kg/km with 95% CL of 124.5-210 kg/km of stream bed. Density in 'prime habitat' was 1/8-1/3 m2 (with a 95% confidence interval of 1/6-7 m2-1/13-16 m2). Recaptures indicated little movement. Ozark Hellbenders are one of the dominant organisms in this stream system.--Copyright 1974, Biological Abstracts, Inc.
W76-01199

THE ALGAL MICROFLORA OF A STRING MIRE IN RELATION TO THE CHEMICAL COMPOSITION OF WATER,
Lund Univ. (Sweden). Dept. of Ecological Botany.
For primary bibliographic entry see Field 5C.
W76-01200

THE HYDROLOGY OF GLACIERS,
British Columbia Univ., Vancouver. Dept. of Geology.
For primary bibliographic entry see Field 2C.
W76-01246

MEASUREMENTS OF WIND-DRIVEN FLOW PROFILES IN THE TOP MILLIMETER OF WATER,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
W. McLeish, and G. E. Putland.
Journal of Physical Oceanography, Vol 5, No 3, p 516-518, July 1975. 3 fig, 13 ref.

Descriptors: *Boundary layers, *Viscosity, *Heat transfer, *Winds, *Laboratory tests, Interfaces, Velocity, Shear, Laminar flow, Turbulent flow, Surfaces, Measurements.
Identifiers: *Radiometric measurements, Velocity profiles.

Radiometric measurements have demonstrated the existence of a conductive sublayer in laboratory experiments at moderate air speeds. The viscous sublayer in water is thicker than the conductive sublayer. Information on the thickness of these sublayers at a water surface is necessary to measure ocean temperature and heat flow radiometrically. Profiles of velocity in the top millimeter of water in a wind-water tunnel were measured from cine photographs of clouds of microscopic hydrogen bubble tracers. The depth interval of 0.005 cm between measurements provided several velocity readings within the depth region in which a linear viscous sublayer might be expected. The linear portion of the velocity profile at the surface represented a viscous sublayer, which was thinner than that at a solid boundary with the same stress. This was believed to represent the first direct measurement of a viscous sublayer at a water surface. The viscous sublayer supports the previous evidence for a conductive sublayer sufficiently thick for radiometric heat flow measurements with moderate wind speeds. (Singh-ISWS)
W76-01260

INVENTORY OF POTENTIAL AND EXISTING UPSTREAM RESERVOIR SITES, TAUNTON AND NARRAGANSETT BAY STUDY AREAS.
Soil Conservation Service, Amherst, Mass.
For primary bibliographic entry see Field 7C.
W76-01269

CHEMISTRY OF MUN-WATER INTERFACE IN AN IMPOUNDMENT,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 2K.
W76-01304

AN EVALUATION OF SEDIMENT TRAP METHODOLOGY,
Toronto Univ., Ontario (Canada), Dept. of Zoology.
For primary bibliographic entry see Field 2J.
W76-01313

SEDIMENTATION IN LAKE LEMON, MONROE COUNTY, INDIANA,
Indiana State Dept. of Natural Resources, Bloomington.
For primary bibliographic entry see Field 2J.
W76-01314

LAND-CAPABILITY CLASSIFICATION OF THE LAKE TAHOE BASIN, CALIFORNIA-NEVADA, A GUIDE FOR PLANNING,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-01346

DECISION TO CONTROL EUTROPHICATION,
Canada Centre for Inland Waters. Burlington (Ontario).
For primary bibliographic entry see Field 5G.
W76-01352

MANAGEMENT OF THE INTERNATIONAL GREAT LAKES,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6E.
W76-01358

REGULATION OF GREAT LAKES WATER LEVELS, A SUMMARY REPORT, 1974.
International Joint Commission-United States and Canada. Great Lakes Levels Board.
For primary bibliographic entry see Field 4A.
W76-01395

UPTAKE AND MIGRATION OF TRACERS IN LAKE SEDIMENTS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
A. Lerman, and T. A. Lietzke.
Limnology and Oceanography, Vol 20, No 4, p 497-510, July 1975. 5 fig, 3 tab, 33 ref.

Descriptors: *Great Lakes, *Radioisotopes, *Adsorption, *Sediments, *Mathematical models, *Lake Erie, *Lake Ontario, Sedimentation, *Tracers, Diffusion, Flow, Equations, Pore water, Chemical reactions, Strontium, Cesium, *Path of pollutants.
Identifiers: Chemical balance, Uptake.

Mathematical solutions were given for an equation describing transient and steady state concentrations in lake water and sediments with adsorption, decay, sedimentation, and diffusion. The results were compared with the distributions of two tracers, Sr90 and Cs137, in the sediments of Lakes Erie and Ontario. Experimental data supported the treatment of adsorption of the tracers by sediment particles as a linear exchange reaction. Sr90 was adsorbed less strongly than Cs137 by the sediments. This accounted for the greater depth of Sr90 occurrence in lake sediments. Distribution of the radionuclide activities in sediments was compatible with a model based on mean steady input to the lakes for 16 years and these values of diffusion coefficients in the pore water: for Sr90, 0.000002 to 0.0000004 sq cm/sec; and for Cs137, 0.00002 sq cm/sec. Another transport mechanism in sediments, sedimentation, was more significant in Lake Erie than in Lake Ontario. Conditions were outlined under which the fluxes from lake water to sediments would be important in the chemical balance of medium and large lakes. (Adams-ISWS)
W76-01475

A SIMPLE DIFFUSION MODEL OF THE MEAN FIELD DISTRIBUTION OF SOLUBLE MATERIALS IN THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5B.
W76-01476

POTENTIAL TEMPERATURES IN DEEP FRESHWATER LAKES,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
D. M. Farmer.
Limnology and Oceanography, Vol 20, No 4, p 634-635, July 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Thermocline, *Freshwater, *Lakes, Water temperature, Deep water, Stability, Density, Temperature, Limnology, Canada.
Identifiers: *Adiabatic effects, *Dimictic lakes, *Lake Baikal(Canada).

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Attention was drawn to the implications of adiabatic effects when examining the static stability of fresh water lakes. Although adiabatic effects are known to be small in lakes, especially near the temperature of maximum density, there is clearly a need to know just how small they are. A method was presented for finding potential temperatures in deep dimictic lakes. Though the adiabatic effect is very small it may be significant in special applications. (Lardner-ISWS)
W76-01477

CHARACTERIZATION OF SLUSH ICE IN THE GREAT LAKES,
Coast Guard Research and Development Center, Groton, Conn.
For primary bibliographic entry see Field 2C.
W76-01487

SIMULTANEOUS PROCESS-RESPONSE STUDY ON THE EAST AND WEST COASTS OF LAKE MICHIGAN,
University of South Florida, Tampa.
For primary bibliographic entry see Field 2J.
W76-01494

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA - LAKE ERIE, VOLUME I - SYNTHESIS,
Cleaveland Dept. of Public Utilities, Ohio. Div. of Utilities Engineering.
For primary bibliographic entry see Field 5B.
W76-01500

2I. Water In Plants

REMOTE SENSING TECHNIQUES FOR EVALUATION OF SOIL WATER CONDITIONS,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 7B.
W76-01067

HIGH RATE SPRINKLING OF A LOW INTAKE SOIL,
Agricultural Research Service, Brawley, Calif.
For primary bibliographic entry see Field 3F.
W76-01069

ANHYDROUS AMMONIA APPLICATION IN IRRIGATION WATER VS. MECHANICAL AND ITS EFFECT ON CORN YIELDS,
Nebraska Univ., Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-01072

ALTERNATE-FURROW IRRIGATION OF FINE TEXTURED SOILS,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-01073

THE EFFECT OF SOIL WATER SUPPLY ON CORN FERTILIZER RESPONSE,
Agricultural Research Service, Morris, Minnesota.
For primary bibliographic entry see Field 3F.
W76-01075

IRRIGATION TIMING BY THE STRESS DAY INDEX METHOD,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-01082

EFFECTS OF INUNDATION PERIOD ON SEEDLING GROWTH,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-01084

ORGANIC ACID CHANGES IN THE EPIDERMIS OF VICIA FABA AND THEIR IMPLICATION IN STOMATAL MOVEMENT,
Agricultural Research Service, Watkinsville, Ga.
J. E. Pallas, Jr., and B. G. Wright.
Plant Physiol, Vol 51, No 3, p 588-590, 1973.

Descriptors: *Stomata, Organic acids, Plant physiology, Epidermis.
Identifiers: Vicia faba.

Considerable evidence indicates that the increase in guard cell turgor resulting in stomatal opening is brought about by active K+ uptake into guard cells. Only a small increase in inorganic anions appears to accompany the increase in K+. A plausible explanation is that organic acids are produced within guard cells and act as counterions, whereas the H+ produced are exchanged for K+. This hypothesis was tested by using different levels of ambient CO2 in light to control stomatal aperture and at the same time measure changes in organic acid production in the epidermis of V. faba. Epidermal strips were used, quickly frozen in liquid nitrogen, and later extracted. A positive correlation was found between stomatal resistance (r sub s, indirect measure of stomatal aperture) and CO2 level. With decreases in r sub s, total titratable acidity increased. The organic acids, glyceric, malic, and citric, in the epidermis, as measured by gas chromatography of trimethylsilyl derivatives, increased. Changes in glucose or sucrose were not found. These analyses provided evidence that organic acid production in the epidermis is associated with stomatal opening.--Copyright 1973, Biological Abstracts, Inc.
W76-01107

RELATIONSHIPS BETWEEN LEAF WATER STATUS, ABSCISIC ACID LEVELS, AND STOMATAL RESISTANCE IN MAIZE AND SORGHUM,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div.
M. F. Beardsell, and D. Cohen.
Plant Physiology, Vol 56, No 2, p 207-212, August, 1975. 7 fig, 1 tab, 30 ref.

Descriptors: *Plant growth, *Plant physiology, *Moisture stress, *Stomata, *Drought tolerance, Water requirements, Soil-water-plant relationships, Irrigation effects, Moisture deficit, Nutrient requirements, Osmotic pressure, Water balance, Turgidity, Corn(Field), Sorghum, Transpiration.
Identifiers: *Water potential, *Stomatal diffusion resistance, *Abscisic acid levels, Maize(Zea mays L. var. Wisconsin 575), Sorghum(Sorghum bicolor, hybrid NK145).

Water potentials, stomatal diffusion resistance, and abscisic acid levels were measured in the leaves of maize (Zea mays L. var. Wisconsin 575) and sorghum (Sorghum bicolor, hybrid NK145) plants subjected to a drought-recovery cycle under controlled environmental conditions. Over a narrow range of water potential (-8 to -10 bars), abscisic acid levels began to rise and the stomata closed. Abscisic acid levels continued to rise after the stomata closed. The maximum amount of abscisic acid extracted from maize leaves was about twice that from sorghum, and represented a similar proportional increase over the control level. It is concluded that stress response patterns in maize and sorghum are similar. Stomatal diffusion resistance and abscisic acid rise at slightly lower levels of leaf water potential in sorghum, which also appears to recover more rapidly upon rewatering. A lag of at least 60 minutes before an increase in abscisic acid level can be detected. maize indicates that a redistribution of endogenous abscisic acid rather than synthesis may be involved in the initial closure of stomata. paired stomatal functioning after stress does not appear to be associated with high residual levels abscisic acid in the leaf. (Robinett-Arizona)
W76-01117

UPTAKE AND TRANSLOCATION OF AMMONIA BY FRESHWATER HYDROPHYTES,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. W. Toetz.
Ecology, Vol 55, No 1, p 199-201, 1974.

Descriptors: *Aquatic plants, *Ammonia, Translocation.
Identifiers: Ceratophyllum demersum, Elodea densa, Scirpus.

Elodea densa roots absorbed 15NH4 and translocated it to the apical tissues, while Scirpus did not. Submerged leaves and stems of Ceratophyllum demersum also transported 15N to the apices.--Copyright 1974, Biological Abstracts, Inc.
W76-01161

EFFECT OF MOISTURE STRESS ON RED MAPLE SEEDLINGS FROM DIFFERENT SEED SOURCES,
Agricultural Research Service, Delaware, Ohio. Shade Tree Ornamental Plants Lab.
For primary bibliographic entry see Field 2D.
W76-01196

CONTRIBUTION TO THE TAXONOMY AND ECOLOGY OF FRESH-WATER MOLLUSKS IN STREAMS OF CENTRAL SPAIN, (IN SPANISH)
Junta de Energia Nuclear, Madrid (Spain). Laboratorio de Radioecology.
G. De Los Santos, and A. Perez-Minguez.
Bol R Soc Esp Hist Nat Secc Biol. Vol 69, No 1-2, 125-149, 1971. Illus., English summary.

Descriptors: *Gastropods, *Mollusks, Habitats, Rivers, *Ecology, *Systematics.
Identifiers: *Bivalves, Spain, Taxonomy, Tajo River.

Six species of bivalves and eleven of gastropods from some localities of the Tajo river (Spain) were studied ecologically and systematically. In each of the habitats, their ecological characteristics were determined.--Copyright 1974, Biological Abstracts, Inc.
W76-01288

2J. Erosion and Sedimentation

NO-TILLAGE SYSTEM REDUCES EROSION FROM CONTINUOUS CORN WATERSHEDS,
Agricultural Research Service, Coshocton, Ohio.
L. L. Harrold, and W. M. Edwards.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 3, p 414-418, May-June 1974. 2 fig, 4 tab, 7 ref.

Descriptors: *Soil erosion, *Corn, Crop response, Crop production, Farm management, Climatic data, Rainfall-runoff relationships, Agriculture, Erosion, Erosion control, Erosion rate, *Sediment transport.
Identifiers: No-tillage management.

Soil erosion from seven large events on the two watersheds in the same conventional rotation cropped in the 1941-1969 period were sufficiently comparable to form a base on which to judge the effectiveness of the no-tillage system in the 1970-1973 period. Data for the period of identical treatment show little or no effect of land slope difference

12.7% and 5.8%. In the period of continuous corn, 1970-1973, erosion from the conventional tillage corn watershed remained high, while that from the no-tillage corn system decreased sharply. In 1973, differences in soil erosion were striking. Photographs taken after the July 10, 1973 event show signs of large amounts of sediment movement from the conventional tillage corn watershed. There was no evidence of sediment movement from the continuous corn watershed in the no-tillage system. (Skogerboe-Colorado State)
W76-01078

EDIMENT YIELD FROM SOUTHWEST DAHO RANGELAND WATERSHEDS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
C. W. Johnson, G. R. Stephenson, C. L. Hanson, L. L. Engleman, and C. D. Engelbert.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2505, American Society of Agricultural Engineers, St. Joseph, Michigan. 17 p, 6 fig, 7 tab, 15 ref.

Descriptors: *Sediment yield, Idaho, Watersheds(Basins), Watershed management, Runoff, Stream erosion.

Information collected shows that a small percentage of yearly runoff produces most of the yearly sediment and that major floods occur during the winter. Contrary to what is normally observed, sediment concentrations and yearly sediment yield increased with watershed size. Stream bank erosion seemed to be the main source of sediment on the largest watersheds and 'channel flushing' caused high sediment concentrations. (Skogerboe-Colorado State)
W76-01086

HE GEOCHEMISTRY OF SEDIMENTS FROM HE NORTHERN REYKJANES RIDGE AND HE ICELAND - FAROES RIDGE,
Texas A and M Univ., College Station. Dept. and Oceanography; and Texas A and M Univ., College Station. Coll. of Geosciences.
For primary bibliographic entry see Field 2K.
W76-01097

OSTDEPOSITIONAL INJECTIONS OF URANIM-RICH SOLUTIONS INTO EAST PACIFIC SE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science. Miami, Fla.
For primary bibliographic entry see Field 8E.
W76-01098

NOTE ON THE EFFECT OF CHEMICAL EATMENTS IN THE MINERALOGICAL UDIES OF SEDIMENTS,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-01109

TRIENT AND SEDIMENT DISCHARGE OM AGRICULTURAL WATERSHEDS IN KLAHOMA,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 2A.
W76-01116

OATABLE BREAKWATER,
For primary bibliographic entry see Field 8B.
W76-01130

ALITY OF SURFACE WATERS OF THE ITED STATES, 1969: PART 2. SOUTH AT-LANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-01176

MAP SHOWING FLOOD OF APRIL 1975 AT EAST LANSING, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 2E.
W76-01188

MAP SHOWING FLOOD OF APRIL 1975, LANSING, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 2E.
W76-01189

MEANDERING OF SUPRAGLACIAL MELT STREAMS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-01261

DEPOSITIONAL ENVIRONMENT INTERPRETATION FROM SETTLING-VELOCITY (PSI) DISTRIBUTIONS,
California Univ., Los Angeles, Dept. of Geology.
W. E. Reed, R. Le Fever, and G. J. Moir.
Geological Society of American Bulletin, Vol 86, No 9, p 1321-1328, September 1975. 8 fig, 3 tab, 41 ref.

Descriptors: *Sedimentary petrology, *Settling velocity, Sediments, Deposition(Sediments), Beaches, Dunes, Rivers, Sands, Fluvial sediments, Hydraulics, Fluid mechanics, Hydrodynamics, Density, Particle size, Sampling, Laboratory tests, Sieve analysis, Numerical analysis.
Identifiers: *Sand textures, Multivariate discriminant-function analysis, Fluvial sands, Settling tube.

Multivariate discriminant-function analysis of settling-velocity (Psi) distributions of sands provides a reliable technique for environmental interpretation. Nearly complete environmental separation was achieved by this computational procedure using settling-velocity parameters for 81 samples of sand from desert dune, fluvial, and beach environments. The curve shape of sieved grain-size distributions plotted on probability paper does not appear to be a reliable guide for interpreting depositional environments. Comparison with settling-tube data indicates that sieving may distinguish grain-size distributions unrelated to the hydraulic characteristics of sediments and may not distinguish hydraulically important modalities. (Lee-ISWS)
W76-01265

EFFECTS OF AGRICULTURE ON EROSION AND SEDIMENTATION IN THE PIEDMONT PROVINCE, MARYLAND,
Denver Univ., Colo. Dept. of Geography.
J. E. Costa.
Geological Society of America Bulletin, Vol 86, No 9, p 1281-1286, September 1975. 5 fig, 2 tab, 41 ref.

Descriptors: *Erosion, *Sedimentation, *Maryland, *Deposition(Sediments), *Agriculture, Soil erosion, Sediment transport, Sediment load, Sediment discharge, Land use, Flood plains, Sediment yield, Reservoir silting, Hydrology.
Identifiers: *Sediment balance equation, Piedmont watershed, Sheetwash deposits, Stream-channel response, Reservoir sedimentation rate.

A study of surficial deposits in the Piedmont province of Maryland has made it possible to construct a balance equation of sediment production and deposition since erosive agricultural land use began in the 1700s. Truncated Piedmont upland soil profiles imply approximately 0.15 m of soil erosion. Reservoir sedimentation rates imply that 34% of the eroded sediment has been carried out of the system. The rest of the sediment remains in the watershed as alluvium in the upper 1 m of flood plains and as colluvium and sheetwash deposits on hillslopes. Agricultural sediment stored in flood plains constitutes 14% of the estimated soil erosion. The sediment was deposited mostly by overbank deposition at rates as high as 1.6 cm/yr. The remaining 52% of the eroded sediment occurs as colluvium and sheetwash deposits on hillslopes and as fan-shaped colluvial-alluvial deposits at junctures of headwater tributaries. Wood from such deposits was radiocarbon dated at 290 plus or minus 100 yr. A buried junk pile in a flood plain yielded license plates whose dates imply that after 1925 the dump was buried by overbank deposits at rates as high as those for a basin undergoing urbanization. Piedmont basins less than 26 sq km have statistically longer bankfull recurrence intervals than streams with drainage area greater than 25 sq km. This suggests that since the decline of agricultural land use in the early 1900s, small upland tributaries have adjusted to decreased sediment loads. (Lee-ISWS)
W76-01266

SPECIAL SOLUTIONS FOR NONLINEAR EROSION PROBLEMS,
Minnesota Univ., Minneapolis. School of Mathematics.
J. C. Luke.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-001 360, $3.25 in paper copy, $2.25 in microfiche. Journal of Geophysical Research, Vol 79, No 26, p 4035-4040, September 10, 1974. 6 fig, 19 ref, 1 append. ONR N-00014-67-A-0094-0014.

Descriptors: *Erosion, *Sediment transport, *Weathering, *Model studies, Geomorphology, Streamflow, Soil formation, Sedimentation, Sediments, Sediment load, Suspended solids, Mathematical models, Flow, Fluid mechanics, Land forming.

A nonlinear system of differential equations was set up to describe evolution of landforms, and several previous models of weathering phenomena and sediment transport were found to follow as limiting cases. It was shown that an unexpectedly large class of nonlinear wavelike solutions can be obtained by the method of characteristics in certain cases. The geometry of the wave fronts was found by means of a Legendre transformation; this was equivalent to the study of solutions of constant form. The method was applied to a specific curved surface as an example, and the results were illustrated in several diagrams. Finally, a nonlinear stream formation problems was considered. (Sims-ISWS)
W76-01296

MULTIPLE OFFSHORE BARS AND STANDING WAVES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W76-01298

SOIL EROSION ON SELECTED HIGH CLAY SUBSIOLS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
M. J. M. Romkens, D. W. Nelson, and C. B. Roth.
Journal of Soil and Water Conservation, Vol 30, No 4, p 173-176, July-August 1975. 2 fig, 3 tab, 8 ref.

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Descriptors: *Erosion, *Soil erosion, *Clays, Subsoil, Erosion rates, Simulated rainfall, Soil surfaces, Soil profiles, Soil properties, Construction, Erosion control, Soil management, On-site investigations.
Identifiers: *Construction site erosion, Soil erodibility, High clay subsoil, Soil loss.

Soil erosion rates on six high clay subsoils were measured during a series of simulated rainstorms. Soil erodibility factors computed for both tilled and scalped surface conditions differed appreciably from the K values predicted by the soil erodibility nomograph. K values for tilled subsoils were consistently smaller and those from scalped subsoils generally higher than the nomograph-predicted values. Deviations were attributed to the effects of aggregate size and stability. Scalped surface conditions were recommended as standards for evaluating subsoil erodibility. A soil management factor was used to describe soil erosion from other than scalped surfaces. (Lee-ISWS)
W76-01308

USE OF ERTS-1 IMAGERY TO INTERPRET THE WIND EROSION HAZARD IN NEBRASKA'S SANDHILLS,
Nebraska Univ., Lincoln. Conservation and Survey Div.
P. M. Seevers, D. T. Lewis, and J. V. Drew.
Journal of Soil and Water Conservation, Vol 30, No 4, p 181-183, July-August 1975. 4 fig, 8 ref.

Descriptors: *Winds, *Erosion, *Nebraska, *Remote sensing, Soils, Ranges, Satellites(Artificial), Sands, Soil erosion, Mapping, Land resources, Erosion rates, Range management, Vegetation.
Identifiers: *Wind erosion, *ERTS, Sandhills(Neb), Multispectral scanner.

Images from the Earth Resources Technology Satellite (ERTS-1) were interpreted for mapping areas in the Nebraska Sandhills where wind erosion had been severe and blowouts had formed and for mapping vegetative cover on rangeland to pinpoint places where future wind erosion was likely. Using images from May 1973 in the visible red wave length (MSS band 5), it was possible to construct maps showing blowout distribution. It was also possible, using the same images and a densitometer, to map areas where the range is in poor condition and vegetative cover so low that wind erosion is likely to occur. These maps will be useful in pinpointing areas in the Sandhills where range management practices need to be improved. (Lee-ISWS)
W76-01309

SEDIMENTATION OF ORGANIC MATTER IN ST. MARGARET'S BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 2L.
W76-01311

AN EVALUATION OF SEDIMENT TRAP METHODOLOGY,
Toronto Univ., Ontario (Canada), Dept. of Zoology.
W. B. Kirchner.
Limnology and Oceanography, Vol 20, No 4, p 657-660, July 1975. 5 tab, 12 ref.

Descriptors: *Sediment sorting, *Instrumentation, *Lakes, *Sediments, *Canada, Lake sediments, Suspended solids, Suspendion, Limnology, Turbulence, Tubidity, Secchi disk, Thermal stratification, Sedimentation, Measurement, On-site investigations, Sampling, Trap efficiency.
Identifiers: *Sediment traps, *Catching efficiency, *Crawford Lake(Canada), Trap size, Sediment collecting period.

Five sediment traps with collecting areas ranging from 8 to 1465 sq cm collected the same amount of material, as measured by dry weight, ash weight, and phosphorous content, on a unit area basis. Variances from different size traps were not significantly different. These results were presented as further illustration that traps are a meaningful technique for measuring sedimentation in certain lakes. (Lee-ISWS)
W76-01313

SEDIMENTATION IN LAKE LEMON, MONROE COUNTY, INDIANA,
Indiana State Dept. of Natural Resources Bloomington.
E. J. Hartke, and J. R. Hill.
For sale by Indiana Geological Survey, Bloomington, Indiana, 47401, for $1.00. Geological Survey Occasional Paper 9, 1974. 18 p, 14 fig, 4 tab, 4 ref.

Descriptors: *Lake sediments, *Storage capacity, *Sedimentation, *Suspended solids, *Indiana, Sampling, Hydrology, Lakes, Sedimentation rates, Sustained yield, Analysis, Sediments.
Identifiers: *Lake Lemon(Ind), Sediment samples.

The watershed hydrology, collection of sedimentation and water quality data, and analyses of these collected data were described for Lake Lemon, Monroe County, Indiana. Future sedimentation rate was predicted. The sedimentation rate in Lake Lemon was shown to be low, equal to 0.17% per year. The water in the lake had murky brown color with a vertical visibility of 6 to 12 inches in sunlight. Suspended sediment concentration near the surface was equal to 0.8 to 7.2 mg/l. The lake lost only 3.4% of the total capacity due to low sedimentation rate. With a present annual sedimentation rate of 0.17% it was estimated that the capacity of the lake would be reduced by half in about 290 years. (Bhowmik-ISWS)
W76-01314

MORPHOLOGY OF AN ARCTIC RIVER BAR,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W76-01319

MASS MOVEMENT OF MISSISSIPPI RIVER DELTA SEDIMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W76-01322

THE INTERACTION OF FLUID AND SEDIMENT ON THE FORESHORE,
Chicago Univ., Ill. Dept. of Geophysical Sciences; and Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
For primary bibliographic entry see Field 2L.
W76-01326

GEOMORPHOLOGY OF A GLACIATED FIRST-ORDER VALLEY IN SOUTH CENTRAL NEW YORK,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
L. A. Daugherty, W. E. Hanna, and R. W. Arnold.
Soil Science Society of America Proceedings, Vol 39, No 4, p 710-716, July-August 1975. 6 fig, 2 tab, 9 ref.

Descriptors: *Soils, *Geomorphology, *New York, Valleys, Watersheds(Basins), Glaciation, Solifluction, Terraces(Geologic), Stratigraphy, Soil profiles, Soil surveys, Soil types, Erosion, Deposition(Sediments).
Identifiers: *Soil mapping, Periglacial, Congelitrubate, Soil morphology, Hillslope, Valley bottom.

A glaciated first order valley in south central Ne York was studied to determine the post glac evolution of the landforms. Ninety seven profi were sampled at depth intervals of approx mate 30 cm to determine internal features of the lan scape units. Particle size difference were the ma indicators of lithologic discontinuities. Arithmet mean of the fine earth particle size in conjuncti with the relative amounts and orientation of coar fragments were useful in determining strata of t summit, shoulder, backslope, footslope, toeslo and the high, intermediate, and low level terrace Congeliturbate as much as 10 m deep was found the basin at the head of the stream in foot a toeslope areas. The downstream portion of the deposits has been deeply entrenched by t stream. During periglacial times congeliturbate the downstream channel contributed to tempora base levels of the stream. Much of this congeliturbate remains as terraces. The alluvium resulti from the entrenchment of the congeliturbate o curs as a series of 92 terrace remnants. It is b lieved that their strata, relative elevation, a gradient contain clues to the complex sequence erosional and depositional events. (Lee-ISWS)
W76-01469

TURBULENCE MEASUREMENT OF A FLO WITH SUSPENDED SOLID PARTICLES,
Gifu Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-01470

SEDIMENT ROUTING FOR AGRICULTURA WATERSHEDS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 4D.
W76-01471

UPTAKE AND MIGRATION OF TRACERS I LAKE SEDIMENTS,
Northwestern Univ., Evanston, Ill. Dept. Geological Sciences.
For primary bibliographic entry see Field 2H.
W76-01475

SIMULTANEOUS PROCESS-RESPONSE STUD ON THE EAST AND WEST COASTS OF LAK MICHIGAN,
University of South Florida, Tampa.
R. A. Davis, Jr., and W. T. Fox.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as AD-A0 647, $4.50 in paper copy, $2.25 in microfich Technical Report No 13, December 1974. 61 p, 2 fig, 1 tab, 23 ref, 2 append. ONR 388-092/10-1 68(414). ONR N00014-69-C-0151.

Descriptors: *Lake Michigan, *Waves(Water *Erosion, *Sedimentation, Lakes, Sedimentar structures, Weather, Winds, Data collections, On site investigations, Beaches, Shores, Sand Beach erosion, Geomorphology, Currents(Water Limnology.

A 15-day time-series study was conducted simu taneously on both the east and west sides of Lak Michigan during the summer of 1974. Sites at Zion Illinois, and South Haven, Michigan, were in vestigated following the same procedures use during previous Lake Michigan studies. Primar objective of the study was to determine the natur of process-response activities as a single weathe system moves offshore and onshore as its crosse the lake. Only one low pressure system passe over the study area during the period of investiga tion. Observed patterns in the weather, waves, an currents were quite similar at both sites and wer similar to patterns from previous studies. I general, energy was higher on the east sid (onshore) as compared to the west side (offshore) The low intensity of the passing weather syste was reflected in the small amount of change to th beach and nearshore morphology. Increasing ener

gy caused erosion to the strand area and deposition in the plunge zone. During maximum energy conditions the plunge zone was eroded and deposition took place on the foreshore. Changes in processes and the topographic responses occurred simultaneously on both sides of the lake, at least within the limits of sampling intervals. (Sims-ISWS)
W76-01494

COASTAL PROCESSES AND SEDIMENTATION ON THE NEW ENGLAND COAST,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 2L.
W76-01498

2K. Chemical Processes

THE GEOCHEMISTRY OF SEDIMENTS FROM THE NORTHERN REYKJANES RIDGE AND THE ICELAND - FAROES RIDGE,
Texas A and M Univ., College Station. Dept. and Oceanography; and Texas A and M Univ., College Station. Coll. of Geosciences.
A. Horowitz.
Marine Geology, Vol 17, No 2, p 103-122, Sept, 1974, 4 fig, 3 tab, 46 ref.

Descriptors: *Analytical techniques, *Volcanoes, *Heavy metals, *Mineralogy, *Sedimentology, *Geochemistry, *Seismic studies, *Lead, *Iron, *Manganese, Copper, Chromium, Zinc.
Identifiers: *Geographical regions, Geochemical partition studies, Bulk chemical analyses, Iceland, Atomic absorption spectroscopy, X-ray diffraction, *Lithium.

Samples from active Reykjanes Ridge and the inactive Iceland - Faroes Ridge have been investigated sedimentologically, mineralogically, and geochemically. The sediments display polymodal grain-size distributions and are poorly sorted, indicating deposition by various mechanisms and contributions from numerous sources. The mineralogy strongly reflects the large input of volcanic ash and ice rafted material. Bulk chemical analyses indicate the Reykjanes Ridge sediments appear to be enriched in Fe, Mn, Cu, Cr, and Zn as has been reported for other active ridges. Faroes Ridge in Iceland does not show this enrichment. Partition studies indicate that enriched Fe and Mn ore are held in separate phases while the other metals are present in all phases. Adsorption are not in major concentrating mechanism for the enhanced elements. Li distributions are apparently unaffected by active ridges and Pb seems to be partially concentrated biologically. There are indications that other criteria must be used in conjunction with bulk chemical analyses, in order to establish the presence of active ridge metal contributions. (Kemp-Vanderbilt)
W76-01097

OXIDATION OF CINNABAR BY FE (III) IN ACID MINE WATERS,
Stanford Univ., Calif. Dept. of Civil Engineering.
. E. Burkstaller, P. L. McCarty, and G. A. Parks.
Environmental Science and Technology, Vol 9, No 7, p 676-678, July, 1975. 4 fig, 4 ref.

Descriptors: *Heavy metals, *Mercury, *Iron, Pollutants, *Oxidation, Mine water, Chlorine, Hydrogen ion concentration, Spectrophotometry, Solubility, Water pollution, Chemical properties, Isotope studies, Mining.
Identifiers: *Cinnabar, *Soluble mercury, Chemical binding, *Isotopic dilution, *Oxidation ate, New Almaden Mine.

A laboratory study was set up to determine the ate of oxidation of cinnabar (HgS) by Fe (III) and he release of mercury to solution under conditions prevalent in acid mine drainage waters. esults show that under certain conditions significant mercury was released to solution. This occured when both Fe (III) and C1(-) were present in solution at environmental levels with a low pH. However, when a large amount of cinnabar was present, most of the mercury released to solution became bound to the cinnabar by an unknown mechanism. For this reason the amount of dissolved mercury was much lower than expected given the high rate of oxidation of cinnabar. An isotopic dilution method was used to calculate the total mercury, both in solution and bound to the remaining cinnabar, released by oxidation. Total iron and soluble mercury were measured by atomic absorption. Chloride was measured by argentometric and mercuric nitrate methods. (Davis-Vanderbilt)
W76-01099

A NOTE ON THE EFFECT OF CHEMICAL TREATMENTS IN THE MINERALOGICAL STUDIES OF SEDIMENTS,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-01109

THE EFFECT OF TEXTURE STRATIFICATION ON SALT ACCUMULATION IN AN ARID LAND SOIL,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. K. Abbass.
Master of Science Thesis, 1974. 53 p, 12 fig, 9 tab, 32 ref.

Descriptors: *Groundwater movement, *Saline soils, *Saline water, *Soil profiles, *Stratification, Groundwater, Soils, Soil properties, Salinity, Soil structure, Sands, Arid lands, Clays, Irrigation effects.

A laboratory soil-column experiment was conducted to study the effect of saline groundwater and soil stratification on salt distribution in soil profiles under fallow condition. In general, the column surfaces of the stratified soils were significantly higher in salt than the homogenous sand and clay soils, due to the upward movement of saline groundwater through the soil column and evaporation at or near the surface. The major ions contributing to the surface salts were Na+, Ca++,and Cl-. The salt in the clay soil columns was higher in Ca++ concentrations and lower in Na+ than in the sandy soil. (McLachlan-Arizona)
W76-01112

TOTAL ALKALINITY AND HARDNESS OF SURFACE WATERS IN ALABAMA AND MISSISSIPPI,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd, and W. W. Walley.
Alabama Agricultural Experiment Station, Bulletin 456, March 1975. 16 p, 4 fig, 6 tab, 28 ref.

Descriptors: *Alkalinity, *Hardness(Water), *Productivity, *Alabama, *Mississippi, Ponds, Streams, Surveys, Geomorphology, Fish harvest.

Studies of small ponds and streams from major physiographic divisions of Alabama and Mississippi showed that total alkalinity was closely related to the nature of surface and subsurface geologic formations. Stream waters generally had higher total alkalinity and total hardness than pond waters. During low flow, streams consisted primarily of ground water which was normally concentrated in ions than runoff. Ponds were usually filled by direct precipitation and runoff thus contained lower ionic concentrations. There was usually a high correlation between total alkalinity and total hardness, which were derived from solutions of calcium and magnesium carbonates in most physiographic areas. When total hardness greatly exceeded total alkalinity, sulfate ions were more abundant. Sodium and potassium were associated with alkalinity anions, where alkalinity greatly exceeded hardness. Calcium was more abundant than magnesium in all waters. Correlations between total hardness and calcium hardness were high for all waters. Correlations between alkalinity and productivity were related to differences in phosphorus and nitrogen concentrations rather than alkalinity. Phytoplankton growth in ponds with low total alkalinity or hardness may be limited by low carbon dioxide or bicarbonate and calcium and should be limed to increase carbon availability for photosynthesis, supply calcium to enhance fish production. (Buchanan-Davidson--Wisconsin)
W76-01144

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
Supt. of Documents, GPO, Wash., D.C. 20402 Price $4.35 (paper copy). Water-Supply Paper 2142, 1974. 625 p, 1 fig, 40 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Southeast US, River basins, Atlantic Ocean, Gulf of Mexico, Basic data collections, Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, Virginia, Physical properties, Streamflow, Sampling, Sites.
Identifiers: *South Atlantic Slope, *Eastern Gulf of Mexico.

During the water year ending September 30, 1969, the Geological Survey maintained 152 stations on 103 streams in the South Atlantic slope and Eastern Gulf of Mexico basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 140 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 33 and daily at 55 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 8 stations during the year ending September 30, 1969. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the completion period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W76-01176

GEOHYDROLOGY AND WATER QUALITY OF THE MISSISSIPPI RIVER ALLUVIAL AQUIFER, NORTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 2F.
W76-01180

IONIZATION OF WATER IN SEAWATER,
Oregon State Univ., Corvallis School of Oceanography.
For primary bibliographic entry see Field 1A.
W76-01239

CHEMISTRY OF MUN-WATER INTERFACE IN AN IMPOUNDMENT,
Illinois State Water Survey, Peoria. Water Quality Section.
W. -C. Wang.

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Water Resources Bulletin, Vol 11, No 4, p 666-675, August 1975. 7 fig, 21 ref.

Descriptors: *Mud-water interfaces, *Impoundments, *Water chemistry, *Chemical properties, *Sediment-water interfaces, *Illinois, Chemical analysis, Instrumentation, Sampling, Water properties, Water quality, Impounded waters, Analytical techniques, Chemical stratification, Oxidation-reduction potential, Hydrogen ion concentration, Chemistry, Analysis, Interfaces, Model studies, Surface waters, On-site investigations, Biology, Temperature, Dissolved oxygen, Stratification, Seasonal, Nitrogen.
Identifiers: Lake Evergreen(Ill), Water chemistry changes, Six-Mile Creek(Ill), Chemical parameters, Biological activity.

Lake Evergreen was investigated during the time of filling and thereafter for changes of water chemistry at the mud-water interface. The results showed that aging or maturing occurs at the nascent stage of the impoundment history. There are many factors affecting concentration of chemical constituents at the interface. Hydrologic changes such as wind and wave action or water circulation can influence all chemical parameters. Biological activity may involve changes in concentrations of silica, phosphate, alkalinity, pH, ammonium, Kjeldahl nitrogen, etc. An associated effect is the reduction of oxidation-reduction potential which in turn affects the concentration of manganese, etc. All these changes occur primarily in autumn. In late spring to summer, there are changes of nitrite and nitrate accompanied by changes in dissolved oxygen. A water chemistry model at the interface was illustrated. (Henley-ISWS)
W76-01304

2L. Estuaries

A NOTE ON THE EFFECT OF CHEMICAL TREATMENTS IN THE MINERALOGICAL STUDIES OF SEDIMENTS,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-01109

BIOGEOCHEMISTRY OF MARSH GASES: EFFECTS OF INORGANIC CONSTITUENTS OF MARSH PLANTS ON METHANE EVOLUTION; AND CARBOHYDRATE STABILITY IN PLANTS,
Delaware Univ., Newark. Coll. of Marine Studies.
F. M. Swain, J. M. Bratt, and J. Sherman.
Technical Report No 30, November 1974. 14 p, 2 fig, 2 tab, 11 ref.

Descriptors: *Evolution, *Marsh plants, *Methane, *Inorganic compounds, Marshes, Gases, Carbohydrates, Alcohols, Humus, Cellulose, Organic acids, Delaware, Microbial degradation.
Identifiers: Succulent plants, Salicornia, Distichlis.

Inorganic components of several species of marsh plants were studied to determine how they relate to methane evolution. Salt-marsh plants showed a relationship between succulence and methane production. The most succulent plants such as Salicornia and Distichlis contributed to relatively low methane evolution Potassium chloride accumulation was high in both plants while sodium and magnesium concentrations were low. The total carbohydrate, the cellulose content of plants cultivated for methane production, and the cellulose content of the supernatant water were studied. The cellulose content of the culture was reduced to traces after several weeks although methane was still produced in high concentrations. Methane-producing bacteria developed best on cellulose substrates, but continued to grow on other carbohydrates. An intermediate stage in the anaerobic digestion of organic matter is the formation of organic alcohols and acids and followed by conversion to methane and carbon dioxide. The degree to which organic acids, alcohols, and other carbohydrate degradation products remain in the environment or are used for further bacterial degradation should be studied in Delaware marshes as they may be important in food chains and may be seasonal. Evaporation of the products may be involved in aerosols that develop in coastal regions. (Buchanan-Davidson--Wisconsin)
W76-01139

SPECIES COMPOSITION, STANDING STOCK, AND NET PRIMARY PRODUCTION OF A SALT MARSH COMMUNITY IN MISSISSIPPI,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
B. C. Gabriel, and A. A. de la Cruz.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11816, $3.50 in paper copy, $2.25 in microfiche. Publication MSGP-73-020, June 1974, 8 p, 2 fig, 2 tab, 11 ref. (NOAA-74111308). Published in Chesapeake Science, Vol 15, No 2, p 72-77, 1974.

Descriptors: *Productivity, *Salt marshes, *Marsh plants, Standing crops, Mississippi, Biomass, Bulrushes, Vegetation, Plant growth, Varieties, Estuaries, Harvesting.
Identifiers: St. Louis Bay Estuary(Miss), Juncus roemerianus, Spartina cynosuroides, Distichlis spicata, Scirpus americanus.

Increases in above ground biomass during the growing season of a vegetationally mixed marsh in St. Louis Bay Estuary, Mississippi, were used to estimate species composition, standing stock, and annual net production. Thirty-four species from eleven taxonomic families of marsh plants were identified. Needlerush Juncus roemerianus, giant cordgrass Spartina cynosuroides, bulrush Scirpus americanus, and salt grass Distichlis spicata were the dominants. The other thirty species occurred only occasionally and did not represent the entire flora of the estuary. Diversity was probably due to variation in salinity. Maximum biomass of alive, dead, and partially decayed plants were observed in July, August, and January, respectively; minimum biomass of alive plants was observed in January. Standing dead biomass was always about the same. Community annual net production estimated by harvest method was 1051 g dry wt or 5012 ash-free Kcal/sq m. Total biomass obtained by reharvesting previously clipped quadrats in various stages of regrowth revealed a seasonal pattern of growth rate with a maximum during late summer and a productivity estimation of 1108 g dry wt or 5541 ash-free Kcal/sq m. (Buchanan-Davidson--Wisconsin)
W76-01164

PROPAGATION OF SPARTINA ALTERNIFLORA FOR SUBSTRATE STABILIZATION AND SALT MARSH DEVELOPMENT,
North Carolina State Univ., Raleigh.
W. W. Woodhouse, E. D. Seneca, and S. W. Broome.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-002 055, $6.75 in paper copy, $2.25 in microfiche. Army Coastal Engineering Research Center TM-46, August 1974. 155 p, 61 fig, 44 tab, 43 ref. DACW72-70-C-0015, DACW72-72-C-0012.

Descriptors: *Marsh plants, *Planning management, *Spoil banks, *Intertidal areas, Vegetation establishment, Salt marshes, Nutrient requirements, Slope stabilization, North Carolina, Estuaries.
Identifiers: Spartina alterniflora.

Stabilization of dredged material in the intertidal zone by establishment of an estuarine marsh plant--Spartina alterniflora (smooth cordgrass)--are described Transplants were more vigorous seedlings and survived on exposed sites at le elevations. They should preferably be plante April and May 0.9 m apart; but have lim growth for the first season Seedlings and s are less tolerant of rigorous conditions and usually only effective in upper one-half of el tion range of S. alterniflora Mature seeds stor 2-3C in salt water and planted 100 viable seed m in the upper 1-3 cm of substrate grew ra and usually produced better cover than transp in the first season. Selecting sites at proper el tions for growth is critical. Stands resisted petition from invading plants in areas of salinity and long periods of inundation. Vari negatively associated with yield were sali manganese, and sulfur, while phosphorus positively associated with yield. Nitrogen phosphorus fertilizers enhanced growth of t plants and seedlings artificially establishe dredge spoil. Salt marshes may be importa recycling nutrients that might otherwise occ estuarine pollutants. (Buchanan-David Wisconsin)
W76-01169

HOLOCENE TRANSGRESSIONS REGRESSIONS ON THE ESSEX CO OUTER THAMES ESTUARY,
Queen Mary Coll., London (England). Dep Geology.
J. T. Greensmith, and E. V. Tucker.
Geol Mijnbouw. Vol 52, No 4, p 193-202. Illus.
Identifiers: Chenier, Coasts, *Estuaries, *Fa Formation, *Holocene transgressions, Mar Mollusks, Peat, Seams, *United Kingdom(Th estuary), *Halocene regressions, Radiocarbo ing.

Faunal and lithological changes within the 34 Holocene sediments of the chenier plain sugg episodes (I-VI) of marine transgression i spersed with 5 episodes of regression. Evid presented for recognizing transgressions inc chenier formation, marsh retreat and ve changes in fauna, involving brackish water a tertidal mollusks. Regressions are interp chiefly from geosols and peat seams. Radioca dates indicate that the transgressive episod III and V first affected the region at about 4000 and 1400 B. P., respectively. The most r one (VI) probably commenced about 300 B. P dates of episodes I and IV can only be co tured. Comparison with similar events global well as in the Low Countries suggests that eu changes in sea level have played a significan in the Holocene history of the Outer Th estuary.--Copyright 1974, Biological Abstr Inc.
W76-01193

BENTHIC FAUNA AND ZOOPLANKTO SOME POLLUTED SWEDISH ESTUARIES,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5B.
W76-01194

CALCULATIONS OF DIFFERENTIAL K MATIC PROPERTIES FROM LAGRANG OBSERVATIONS IN THE WESTERN CA BEAN SEA,
National Oceanic and Atmospheric Admin tion, Miami, Fla. Atlantic Oceanographic Meteorological Labs.
R. Molinari, and A. D. Kirwan, Jr.
Journal of Physical Oceanography, Vol 5, No 483-491, July 1975. 9 fig, 9 ref. NSF AG-253.

Descriptors: *Ocean circulation, *Drift bo *Analytical techniques, Dynamics, Flow, processing, Remote sensing, Move Oceanography.
Identifiers: *Caribbean Sea, *Differential matic properties, Divergence, Vort

Stretching deformation rates, Lagrangian observations.

Observations of the motions of drifter clusters were made in the western Caribbean Sea during the summer of 1971. By two independent analyses of the relative motions of a cluster, two time series of horizontal divergence, vorticity, shear deformation rate, and normal deformation rate were developed. The results of the two approaches were very similar. The time series for these differential kinematic properties were fairly smooth when the drifters were moving in the Yucatan Current. Otherwise, the time series were ragged with frequent changes in sign. It was speculated that the raggedness is due to small values of the shear rates relative to random observational errors or small-scale turbulent processes. The records of the differential kinematic properties were used to evaluate the stretching and material derivative terms of the vorticity equation. Calculations indicated that potential vorticity is conserved along trajectories in the Yucatan Current. (Sims-ISWS)
W76-01257

HORIZONTAL COHERENCE OF TEMPERATURE MICROSTRUCTURE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
A. A. Elliott, and N. S. Oakey.
Journal of Physical Oceanography, Vol 5, No 3, p 506-515, July 1975. 11 fig, 9 ref.

Descriptors: *Oceans, *Temperature, *Thermal properties, *Atlantic Ocean, Internal waves, Sampling, Data processing, Correlation analysis, Oceanography.
Identifiers: *Temperature microstructure, Denmark Strait, Horizontal coherence.

Temperature gradient records from vertical lowering of an array of four thermometers were used to trace microstructure features horizontally over a distance of 46 cm. Identifiable features were found to have a slope and a vertical velocity or curvature with a statistical distribution similar to that expected from an internal wave field superimposed on horizontally-layered microstructure. The horizontal extent of microstructure with a vertical scale greater than 5 cm was at least an order of magnitude greater than its vertical scale. (Sims-ISWS)
W76-01259

MEASUREMENTS OF WIND-DRIVEN FLOW PROFILES IN THE TOP MILLIMETER OF WATER,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2H.
W76-01260

ON THE DEPTH OF THE HALOCLINE IN AN ESTUARY,
Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Marine Science.
R. R. Long.
Journal of Physical Oceanography, Vol 5, No 3, p 551-554, July 1975. 2 fig, 12 ref. ONR N00014-67-A-0163-0013.

Descriptors: *Estuaries, *Saline water-freshwater interfaces, *Depth, *Model studies, Laboratory tests, Inflow, Mixing, Stratification, Interfaces, Density, Salinity, Flow, Circulation.
Identifiers: *Halocline.

The depth of the halocline in an estuary was related to the fresh water influx using simple and general arguments. It was shown that the depth becomes large for both weak and strong influxes. The result was similar to observations in a laboratory experiment and in the Alberni Inlet. (Sims-ISWS)
W76-01270

ALONGSHORE COHERENCE AT LOW FREQUENCIES IN CURRENTS OBSERVED OVER THE CONTINENTAL SHELF OFF OREGON AND WASHINGTON,
Department of the Environment, Ottawa (Ontario). Ocean and Aquatic Affairs.
A. Huyer, B. M. Hickey, J. D. Smith, R. L. Smith, and R. D. Pillsbury.
Journal of Geophysical Research, Vol 80, No 24, p 3495-3505, August 20, 1975. 9 fig, 6 tab, 15 ref. NSF ID071-04211, ERDA AT (45-1)-2225.

Descriptors: *Ocean currents, *Continental shelf, *Pacific Ocean, *Pacific Northwest U.S., Continental slope, Coasts, Currents(Water), Ocean circulation, Winds, Current meters, Flow measurement, On-site investigations, Sea level, Regression analysis, Oceanography.
Identifiers: *Current observations, Spectral analysis, Coherence.

Current observations over the continental shelf at locations off central Oregon and southern Washington had the period from July 18 to September 18, 1972, in common. Low-frequency fluctuations (less than one cycle per day) in the currents were compared by means of visual display, linear regression, and spectral analysis. The currents were highly coherent over an alongshore separation of 200 km. Coherent signals occurred at 0.16, 0.3, and 0.44 cpd. The signal at 0.16 cpd occurred with high mutual coherence in wind, current, and sea level and may be a forced shelf wave driven by the wind. The signal at 0.3 cpd had high coherence between current and sea level and may be a free shelf wave generated by the wind. Correlation between observations was higher for separations in the alongshore direction than in the offshore direction in spite of greater separations. (Sims-ISWS)
W76-01271

INTERNAL WAVE DISPERSION CALCULATED USING THE THOMSON-HASKELL METHOD,
Lamont-Doherty Geological Observatory, Palisades, N. Y.; and Columbia Univ., New York. Dept. of Geology.
M. Fliegel, and K. Hunkins.
Journal of Physical Oceanography, Vol 5, No 3, p 541-548, July 1975. 12 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Internal waves, *Dispersion, *Oceans, *Model studies, Computer models, Mathematical models, Density, Arctic Ocean, Atlantic Ocean, Waves(Water), Oceanography.
Identifiers: Brunt-Vaisala frequency.

The dispersion and amplitude characteristics of internal wave motion were determined by a matrix method which lends itself readily to computer analysis. A layer density structure may be chosen to fit actual oceanic conditions. The method was shown to have good agreement with a simple analytical solution. Dispersion and amplitude characteristics have been determined for two typical oceanic sites, one in the Arctic Ocean and one in the Atlantic. (Sims-ISWS)
W76-01275

TOWARD NEW MASS AND HEAT BUDGETS FOR THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W76-01297

MULTIPLE OFFSHORE BARS AND STANDING WAVES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
A. D. Short.
Journal of Geophysical Research, Vol 80, No 27, p 3838-3840, September 20, 1975. 4 fig, 1 tab, 13 ref.

Descriptors: *Coastal engineering, *Waves(Water), *Standing waves, Shores, *Sedimentation, *Sand bars, *Alaska, Winds, On-site investigations, Sediment transport, Currents(Water), Geomorphology.
Identifiers: *Offshore bars, Progressive waves.

Field measurements of multiple offshore bar spacing were compared to theory and wave measurements to corroborate the suggestion that bar formation an spacing are controlled by standing waves in the infragravity range (0.5-5 min). Theoretical and experimental studies predicted the reflection of progressive waves from a shoreline as standing waves. Associated drift in the bottom boundary layer was expected to produce sediment accumulation and bar formation under either the nodal or the antinodal points. Measurements of waves in the infragravity spectrum confirmed the occurrence of such standing waves, and spacing of offshore bars in adjacent areas correlated well with the predicted position of the bars. (Bhowmik-ISWS)
W76-01298

SEDIMENTATION OF ORGANIC MATTER IN ST. MARGARET'S BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
T. J. M. Webster, M. A. Paranjape, and K. H. Mann.
Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1399-1407, August 1975. 5 fig, 2 tab, 25 ref.

Descriptors: *Sediments, *Organic matter, *Inorganic compounds, *Canada, Food chains, Suspended solids, Seashores, Bays, Phytoplankton, Fish eggs, Sedimentation rates, Runoff, Bottom sediments, Detritus, Sampling, Analysis, Carbon, Kelps, Aquatic plants, Aquatic productivity.
Identifiers: *Sediment traps, *St. Margaret's Bay(Canada), *Nova Scotia, Seaweeds, Seagrasses.

Sediment traps were placed at two sites in St. Margaret's Bay. At a deep station (70m), traps were placed 5m and 10m above the bottom; at a shallow station (10m), six traps were placed between 45 and 197 cm above the bottom. Total catch averaged 118g carbon per sq m per yr at the deep station and 134g carbon per sq m per yr at the shallow station. The most probable source of the organic matter was detritus derived from seaweeds and seagrasses, but the most probable source of inorganic material was bottom sediment. It was suggested that the traps were taking bottom sediment resuspended from shallow water, enriched by detritus from seaweeds and seagrasses. (Lee-ISWS)
W76-01311

MISSISSIPPI RIVER MOUTH PROCESSES: EFFLUENT DYNAMICS AND MORPHOLOGIC DEVELOPMENT,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
L. D. Wright, and J. M. Coleman.
Available from the National Technical Information Service Springfield, Va 22161 as ADA-005-793, $4.00 in paper copy, $2.25 in microfiche. ONR NR-388-002. ONR N00014-69-A-0211-0003. Journal of Geology, Vol 82, p 751-778, 1974. 14 fig, 1 tab, 66 ref.

Descriptors: *Mississippi River, *Geomorphology, *Deltas, Dynamics, Model studies, On-site investigations, Remote sensing, Flow, Sedimentation, Density, Salinity, Sea water, Suspended solids, Land forming, Rivers, River flow, Deposition(Sediments), Estuaries.
Identifiers: *River mouth processes, Salt wedge intrusion, River mouths.

Effects of outflow inertia, turbulence, bottom friction, buoyancy, and marine forces to river mouth

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outflow dynamics and sediment deposition vary. Effluent behavior varies significantly with river stage and between 4 dynamic regions. During low and normal river stages, when a salt wedge intrudes into the distributary channel, Region I, which extends from the mouth to about 4 channel widths seaward, is characterized by buoyancy-dominated lateral effluent expansion, vertical thinning, and vertical saltwater entrainment. In Region II, which is situated over the distributary-mouth bar crest, the density interface approaches closest to the surface, densimetric Froude numbers attain maxima, internal waves break, and intense mixing occurs. Region III, approximately between 6 and 10 channel widths seaward of the mouth, is characterized by an internal hydraulic 'jump' in which densimetric Froude numbers decrease to subcritical values and the depth of the density interface increases. In Region IV, extending about 10 channel widths seaward of the mouth to the seaward limits of the effluent, densimetric Froude numbers are subcritical; the surface effluent expands under the influence of buoyancy and is subject to mixing by marine forces. When the river is flooding, the salt wedge is flushed seaward beyond the bar crest; turbulent mixing, strong bottom shear, and seaward bed-load transport prevail throughout Region I. Under these conditions, the effects of buoyancy are weak. Throughout most of the year, the combined effects of effluent buoyancy and saltwater entrainment create lateral convergence of flow near the bottom and beneath the effluent. (Sims-ISWS)
W76-01321

MASS MOVEMENT OF MISSISSIPPI RIVER DELTA SEDIMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
J. M. Coleman, J. N. Suhayda, T. Whelan, and L. D. Wright.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-001-588, $3.50 in paper copy, $2.25 in microfiche. Proceedings, Gulf Coast Association of Geological Societies, Lafayette, Louisiana, p 49-68, October 1974. 21 fig, 36 ref. ONR NR-388-002, ONR N00014-69-A-0211-0003.

Descriptors: *Mississippi River, *Deltas, *Sediments, Geology, Geomorphology, Deposition(Sediments), Sediment load, Sedimentology, Faults(Geologic), Fractures(Geologic), Folds(Geologic), Marine geology, Estuaries, Continental shelf.
Identifiers: *River mouths, Depositional patterns, Peripheral slumping, Clay flowage.

River-mouth depositional patterns are modified by sediment deformational processes of a magnitude to endanger bottom-supported structures, including: (1) peripheral slumping, (2) differential weighting and dispirism, (3) radial tensional faulting, (4) mass wasting and flowage induced by wave motion and degassing, and (5) deep-seated clay flowage. High depositional rates occur near the river mouth and decrease seaward, and with time the bar oversteepens; rotational slump planes form peripheral to the bar front, moving sediment into deeper water. Differential loading by denser bar sands overlying low-density dlays results in vertical and seaward flowage of the clays along with seaward bar progradation. Diapiric folds and spines (mudlumps) intrude into delta-front sediments on the seaward side of the deforming load. The seaward extrusion and continued movement of clays arch the overlying delta-front sediments. A stress relieved by small graben faults oriented radial to the deforming load or delta lobe. The finer grained river-mouth sediments contain high percentages of methane and CO2 gases. Passage of hurricane waves produces bottom pressure perturbations, forcing the entrapped gas upward, causing loss of sediment strength and allowing subaqueous mass movement to occur. The weight of the modern delta has depressed underlying Pleistocene sands some 120 meters, causing squeezing and flowage of clays onto the continental shelf at water depths greater than 150 meters. (Sims-ISWS)
W76-01322

COASTAL DYNAMICS ON CEDAR ISLANDS, VIRGINIA,
University of South Florida, Tampa. Dept. of Geology.
R. A. Davis, Jr., and W. T. Fox.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA-001-068, $4.50 in paper copy, $2.25 in microfiche. Report USF-11, June 1, 1974. 66 p, 32 fig, 21 ref, 2 append. NR 388-092, ONR N00014-69-C-0151.

Descriptors: *Fourier analysis, *Meteorological data, *Waves(Water), *Currents(Water), *Virginia, Geomorphology, Coasts, Beaches, Winds, Tides, Groundwater, Breakwaters, Environmental effects, Model studies, Computer modesl, Atmospheric pressure, Time series analysis.
Identifiers: *Swell waves, Morphologic variables, Coastal processes, Cedar Islands(Va), Wave energy.

A time studies of coastal processes and morphologic responses was conducted during July 1973 on Cedar Island, Virginia. Patterns exhibited by variations in monitored environmental variables showed interrelationships that are quite comparable to those observed in previous similar studies on Lake Michigan and the central Texas coast. As in previous studies, barometric pressure fluctuations appeared to be the key to controlling other processes. Long period swell waves provided the controlling mechanism when they were present in that they caused total wave refraction and no significant longshore currents were present. The combination of a moderate tidal range (6 feet) and longshore bars caused marked effects on coastal processes such as breaker height and longshore currents. Where longshore bars were absent there was no apparent effect of tidal stage on other coastal processes operating on the beach and in the surf zone. (Lee-ISWS)
W76-01325

THE INTERACTION OF FLUID AND SEDIMENT ON THE FORESHORE,
Chicago Univ., Ill. Dept. of Geophysical Sciences; and Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
C. L. Nelson, and R. L. Miller.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA- 002-452, $7.50 in paper copy, $2.25 in microfiche. Technical Report No 15, September 1974. 176 p, 59 fig, 2 tab, 81 ref.

Descriptors: *Sediment transport, *Suspended solids, *Surges, Bores, Flumes, Equipment, Laboratory equipment, Laboratory tests, Beaches, Coasts, Shores, Seashores, Erosion, Beach erosion, Surf, Flow, Froude number, Hydraulic jump, Intertidal areas, Waves(Water).
Identifiers: Backwash, Uprush, Swash marks, Unidirectional flow.

Investigation of the sediment transport of uprush and backwash of a single surge cycle was made. Direct observation indicated that for the main body of the fluid, accelerating or decelerating unidirectional flow is a reasonable characterization. The uprush, initially a bore, then a surge over a 'dry bed', has traditionally been considered to be so complicated as to defy characterization of the internal flow. However, it was shown that the uprush may be divided into two distinct portions, the leading portion (the tongue) characterized by extreme turbulence and with a high proportion of sediment in suspension and in traction. The remainder of the uprush and the whole of the backwash may be regarded as decelerating or accelerating unidirectional flow, exhibiting the expected but transient sequential bedform featur
It appears that analysis of the bedform mechan
is feasible using unidirectional flow metho
(Sims-ISWS)
W76-01326

A SURVEY FOR THE USE OF REMO SENSING IN THE CHEMICAL BAY REGION,
Maryland Univ., Solomons. Chesapeak Biologi Lab.
For primary bibliographic entry see Field 5B.
W76-01327

STOCHASTIC ANALYSIS AND CONTROL URBAN ESTUARINE WATER-QUALI SYSTEMS: VOL I--ESTIMATION AND PREDI TION,
New York City, Rand Inst. N.Y.
For primary bibliographic entry see Field 5G.
W76-01340

FLOOD WATER ANALYSIS IN THE AREA THE TIDAL RIVER EID (HOCHWASSERANALYSE IM RAUM DER B NENEIDER),
For primary bibliographic entry see Field 2E.
W76-01428

CLASSIFICATION OF MODELS OF TID WATERS,
Monash Univ., Clayton (Australia). Dept. Mechanical Engineering.
J. B. Hinwood, and I. G. Wallis.
Journal of the Hydraulics Division, Ameri Society of Civil Engineering, Vol 101, No HY Proceedings Paper 11643, p 1315-1331, Octo 1975. 1 tab, 141 ref, 1 append.

Descriptors: *Mathematical models, *Ti waters, *Tidal effects, *Estuaries, *Hydraul *Waste disposal, Dispersion, Model stud Simulation analysis, Water quality, Path of po tants, Mixing, Waste water disposal, Water po tion.
Identifiers: *Temporal averaging.

A classification scheme was presented for num cal models of water and waste movement in t bays and estuaries. The classification was ba on the number of spatial dimensions, the refere frame used, temporal resolution obtainable, the degree to which hydrodynamic processes included. Newly developed models can easily fitted into the scheme. With this classificat scheme, different models may be assessed compared on the basis of their theoretical assu tions. To select a model for a particular tas sequence of questions may be answered and f the answers the appropriate type of model may selected. The classification table then indicates models available to meet the requirements of particular physical situation. (Lardner-ISWS)
W76-01481

REGIME EQUATIONS AND TIDAL INLETS,
Coastal Engineering Research Center, Belvoir, Va.
C. Mason.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as AD-A 778, $3.50 in paper copy, $2.25 in microfiche. J nal of the Waterways, Harbors and Coastal gineering Division, American Society of Civil gineers, Vol 99, No WW3, Proceedings Pa 9952, p 393-397, August 1973. 1 tab, 8 ref, 2 pend.

Descriptors: *Channels, *Tidal wat *Inlets(Waterways), Hydraulics, Harbors, Fl Flow characteristics, Regime, Tides, Tidal effe Equations, Shores, Estuaries.
Identifiers: *Regime theory.

Selected regime equations for stable channel cross-sectional areas were compared to an empirical relationship for stable tidal inlet areas. Using an equivalent steady discharge to represent the tidal flow, good agreement was exhibited between the most generalized regime and a tidal prism versus area formula. Although the controlling hydraulic conditions in each case are distinctly unique, the agreement appeared to be more than fortuitous. (Sims-ISWS)
W76-01484

UNIVERSITY OF WASHINGTON WATER STRESS STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W76-01485

CURRENT RELATED TO SEDIMENT TRANSPORT AT THE IBERO-MOROCCAN CONTINENTAL SHELF,
Woods Hole Oceanographic Institution, Mass.
G. Siedler, and E. Seibold.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 400, $3.50 in paper copy, $2.25 in microfiche. Report WHOI-74-86, November 1974. 12 p, 9 fig, 4 tab, 26 ref. ONR N00014-66-C0241.

Descriptors: *Sediment transport, *Continental shelf, *Ocean currents, Currents(Water), Measurement, On-site investigations, Geology, Marine geology, Sedimentology, Continental slope, Oceans, Atlantic Ocean, Oceanography.
Identifiers: *Ibero-Moroccan shelf.

For a study of water motions related to sediment transport, current data and bottom samples were taken in two areas on the Portuguese and Moroccan shelf near the shelf-break and were supplemented by underwater television observations. Some statistical properties of the observed currents were presented, and their representativeness for the water movement very close to the bottom was discussed. It appeared that the slowly varying currents observed were too weak to start sediment transport. To check whether rapidly changing currents would be strong enough, the probability of occurrence of large surface-wave induced components of bottom currents in this area was estimated from wave statistics. It turn out that such oscillatory currents, especially from swell, would be able to set up sediment motion during certain periods. The net transport was caused by slowly varying currents whose average and maximum magnitudes and directions could be obtained from the short time series of the experiment. The geological data, however, supplied some information about the average directions. A sediment transport towards the upper slope was indicated by the regional grain size distribution at the Portuguese shelf. On the average of bottom currents preferred direction of the mean velocity when the sum of surface-wave-induced currents and slowly varying currents was sufficiently large to set up sediment motion. (Sims-ISWS)
W76-01491

THE LIFE CYCLE OF CALIFORNIA COASTAL FOG ONSHORE,
Calspan Corp., Buffalo, N.Y.
For primary bibliographic entry see Field 2B.
W76-01493

COASTAL UPWELLING EXPERIMENT - I AND II, SURFACE HYDROGRAPHIC FIELDS DATA REPORT,
Ronsenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
T. B. Curtin, and C. N. K. Mooers.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 460, $5.00 in paper copy, $2.25 in microfiche. Scientific Report, July 1974. 94 p, 29 fig, 3 tab, 2 ref. NSF GX-31264.

Descriptors: *Upwelling, *Coasts, *Oregon, *Salinity, *Temperture, Continental shelf, Surveys, Ships, Pacific Ocean, On-site investigations, Instrumentation, *Data collections, Data processing, Oceanography.
Identifiers: *Temperature-salinity functions, Fronts(Oceanic).

The report presents all the continuous surface temperature-salinity data recorded aboard Oregon State University vessels during the summers of 1972 and 1973. Most of these cruises constituted part of the Coastal Upwelling Experiments (CUE-1 and CUE-II), a multi-institutional program to study upwelling off the Oregon Coast. The specific objectives of the individual cruises during CUE-I and CUE-II were quite varied; however, the primary focus being the synoptic study of coastal upwelling off Oregon, cruise tracklines were mainly concentrated over the continental shelf region. Surface maps of the temperature, salinity, and density fields at various times during the summers of 1972 and 1973 and of various extents off the Oregon coast were included in the report. In addition, the transshelf variations of these parameters in the surface along two selected lines, the signatures of surface frontal traverses, and the surface temperature-salinity characteristics were presented. (Sims-ISWS)
W76-01496

MATHEMATICAL MODEL STUDIES OF WATER QUALITY IN THE POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 5B.
W76-01497

COASTAL PROCESSES AND SEDIMENTATION ON THE NEW ENGLAND COAST,
Massachusetts Univ., Amherst.
M. O. Hayes.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-775 851, $6.00 in paper copy, $2.25 in microfiche. Final Report, July 1972. 142 p, 31 fig, 2 tab, 7 ref, 2 append. U.S. Army DACW-72-67-C-0004.

Descriptors: *Coasts, *Sedimentation, *Beaches, *New England, Projects, Waves(Water), Ocean waves, Atlantic Ocean, Seashores, Bays, Geomorphology, Sediments, Estuaries, Tidal waters, On-site investigations.
Identifiers: *Cape Cod(Mass).

The report presented an abstracted account of work completed on data collected on the New England coast from central Maine to southern Cape Cod and partially summarized six years of field observations conducted throughout all seasons of the year. It included beach profiles measured at 13 localities, sedimentation studies at five tidal inlets, studies of sediment dispersal patterns, wave-refraction studies, and other studies of coastal morphology and sedimentation. Thirty-five abstracts of completed projects were included in an appendix. (Sims-ISWS)
W76-01498

THE EFFECT OF BREAKER SHAPE ON IMPACT PRESSURES IN SURF,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
R. L. Miller, S. Leverette, J. O'Sullivan, J. Tochko, and K. Theriault.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 451, $4.50 in paper copy, $2.25 in microfiche. Technical Report No 14, September 1974. 51 p, 11 fig, 1 tab, 17 ref, 1 append. ONR N00014-67-A-0285-0018.

Descriptors: *Surf, *Waves(Water), *Beaches, Breakwaters, Bores, Pressure, Ocean waves, On-site investigations, Fluid mechanics, Seashores, Coasts.
Identifiers: *Cape Cod(Mass), Impact pressures, Breaking waves, Breaker mechanics.

Field measurements were made of the vertical distribution of impact pressures exerted by breaking waves, Four distinct types were recognized and compared. These were near-breaking wave, plunging breaker, spilling breaker and post-breaking bore. The measurements were obtained by placing a 6-foot aluminum flat plate, backed by a cylinder in the surf zone, so that the flat faced the approaching breakers. Five sensors were placed at one foot intervals in the flat. The sensors consisted of strain gage mounted aluminum disphragms. Results indicated the impact pressure is significantly influenced by breaker type. The bore generated the largest impact pressures, followed in decreasing order by plunging breaker, spilling breaker and near-breaking wave. In the vertical array, the largest impact pressures were recorded at or near the top, except for the bore where the reverse occurred. A qualitative explanation was given of various phenomena associated with impact pressures, by considering breaker mechanics. (Sims-ISWS)
W76-01499

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS PROCESS USING CROSSLINKED AROMATIC POLYAMIDE MEMBRANES,
Department of the Interior, Washington, D.C. Office of the Secretary.
R. McKinney, Jr., and W. L. Hofferbert.
U.S. Patent No 3,904,519, 6 p, 7 ref; Official Gazette of the United States Patent Office, Vol 938, No 2, p 766, September 9, 1975.

Descriptors: *Patents, *Water purification, *Desalination, *Reverse osmosis, *Separation techniques, *Water quality control, *Membrane processes, *Water pollution control, Saline water, Membranes, Chemical reactions.
Identifiers: Aromatic polyamide membranes.

A reverse osmosis process is used for the purification of saline water. A pressure in excess of the osmotic pressure of the saline water feed solution is applied to the solution separated from purified water by a semipermeable membrane. Pure water is thereby caused to diffuse through the membrane while the salt molecules or other impurities are retained by the membrane. Reverse osmosis membranes of improved flux or flux stability are prepared by crosslinking aromatic polyamide membranes. Crosslinking may be achieved by reaction with crosslinking reagents such as aldehydes, polyamines, polycarboxylic acids, polyisocyanates, oxidizing agents, peroxides, etc. It may also be accomplished by means of irradiation, e.g., with gama radiation. (Sinha-OEIS)
W76-01134

3B. Water Yield Improvement

SNOWPACK DYNAMICS IN RELATION TO INVENTORY-PREDICTION VARIABLES IN ARIZONA MIXED-CONIFER,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-01123

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EFFECT OF SULFURIC ACID ON WATER MOVEMENT IN CALCAREOUS SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
T. A. Yahia.
Master of Science Thesis, 1974. 50 p, 4 fig, 9 tab, 4 append, 42 ref.

Descriptors: *Water utilization, *Calcareous soils, *Penetration, *Soil water movement, *Soil treatment, Water, Water management, Irrigation, Range lands, Irrigated lands, Flow, Movement, Permeability, Leaching, Salts, Chemicals, Sodium.

Sulfuric acid, which may become abundant through industrial by-product recovery, can be used as an aid to increase water penetration of sodium-affected calcareous range land and irrigated soils. Water penetration into calcareous soils was measured in soil columns after sulfuric acid was applied to the soil surfaces. Water penetration reached a maximum with increasing rates of acid application before decreasing at the highest rates. Surface-applied sulfuric acid was more effective than equivalent amounts of applied gypsum. (McLachlan-Arizona)
W76-01124

SOIL WATER DEPLETION BY LODGEPOLE PINE ON GLACIAL TILL,
Intermountain Forest and Range Experiment Station, Ogden, Utah.
For primary bibliographic entry see Field 2G.
W76-01221

ACCUMULATING SNOW TO AUGMENT THE FRESH WATER SUPPLY AT BARROW, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-01323

FREEZING NUCLEATION IN AQUEOUS ELECTROLYTES,
Wyoming Univ., Laramie. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2B.
W76-01479

3C. Use Of Water Of Impaired Quality

AVERT RUNOFF POLLUTION,
For primary bibliographic entry see Field 5D.
W76-01025

RUNOFF CONTROL SYSTEMS FOR CONCRETE DAIRY CATTLE YARDS,
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
For primary bibliographic entry see Field 5B.
W76-01039

REUSE OF EFFLUENT FOR AGRICULTURAL PURPOSES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 5D.
W76-01416

3D. Conservation In Domestic and Municipal Use

WATER REUSE: A FLEXIBLE AND EFFICIENT MANAGEMENT ALTERNATIVE FOR MUNICIPAL WATER SUPPLY,
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 5D.
W76-01330

DETERMINATION OF URBAN WATERSHED RESPONSE TIME,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W76-01339

PRIVATELY-OWNED WATER SUPPLY SYSTEMS,
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa.
A. R. O'Dell, and A. B. McCracken.
Final report, September, 1974. 45 p, 3 fig, 1 tab, 2 append. PA-03-26-1030-01.

Descriptors: Water supply, *Dependable supply, Hydrology, *Storage requirements, *Water distribution(Applied), *Water conveyance, Water policy, *Water supply development, Water allocation(Policy), Planning, Legislation, *Pennsylvania.
Identifiers: Lehigh County(Pa), Northampton County(Pa).

An inventory of almost 50 privately owned water supply systems (PWS) in Lehigh and Northampton Counties was undertaken to assess the current situation and present recommendations and policies to resolve the potential problems which result from proliferation of PWS. Using data obtained from Pa. Department of Environmental Resources (DER) and Public Utilities Commission (PUC), the following information was recorded: name of supplier; PUC regulation; number of customers; percent of total water use by type of customer; average water use per dwelling unit; projected number of fire hydrants; treated water storage tanks; and water supply sources. Potential problems, including conflicts with regional water supply plan, level of service and inadequacy of existing regulations and enforcement emphasize the need to develop water supply guidelines. Conclusions are that (1) private water systems should be identified and regulated during the subdivision review process, and then required to connect with the public water supply system when a feasible extension and adequate supply is available; (2) standards and regulations specifying water supply quantity and facilities for a PWS should be established by DER and PUC; (3) PWS should be allowed in areas where regional water system is not foreseen as they may provide reliable service at lower costs than individual water systems. Appendices include a compilation of applicable regulations and guidelines for water supply systems as well as an environmental assessment of the proposed recommendations. (Salzman-North Carolina)
W76-01366

PRICE-INVESTMENT POLICIES OF URBAN WATER AUTHORITIES,
New South Wales Univ., Kensington (Australia). School of Economics.
For primary bibliographic entry see Field 6C.
W76-01422

URBAN WATER DEMAND: AN ECONOMIC EVALUATION,
Sydney Univ., (Australia). School of Economics.
For primary bibliographic entry see Field 6D.
W76-01423

3F. Conservation In Agriculture

ELONGATION CHARACTERISTICS OF CORRUGATED PLASTIC TUBING,
Ohio State Univ., Columbus
G. O. Schwab, and R. D. Brehm
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974 Chicago, Illinois Paper No 74-2540 American Society of Agricultural Engineers, St Joseph, Michigan. 5 fig, 6 ref.

Descriptors: *Plastic pipes, Plastic deformation, Temperature, Pipelines, Construction, Tubes
Identifiers: Corrugated tubing, Elongation, Stretching.

Elongation (stretch) of circular corrugated plastic tubing decreased parallel plate stiffness at 5% deflection about 1.6%, 2.3%, and 0.4% for each one percent elongation of 76 mm (3-in, 102 mm (4 in.), and 152 mm (6-in) diameter tubing, respectively. Four brands of tubing were included in the tests. Stiffness of 203 mm (8-in) diameter tubing consistently (4 brands) increased up to 5% elongation with only a small decrease at 10%. In other tests the elongation of three brands of 102 mm tubing varied from about 2 to 6% at 23 C (standard test temperature) and from 9 to 18% at 70 C. For all three brands tested, elongation varied linearly with temperature. Spiral corrugations showed less elongation than circular corrugated tubing. Elongation of corrugated tubing in the field as installed with several trenching machines varied from zero to 4.5% with an average of 2.1%. Although tubing temperature was high (35 to 52 C), temperature did not appear to be a major cause of stretching. Frictional drag and other effects as the tubing passed through the machine caused most of the stretching. The study showed that elongation is not a serious (up to 5%) problem unless the contractor is careless or intentionally stretches the tubing. (Skogerboe-Colorado State)
W76-01064

STEADY INFILTRATION FROM LINE SOURCES BURIED IN SOIL,
Department of Agriculture, Watkinsville.
A. W. Thomas, E. G. Kruse, and H. R. Duke.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 1, p 125-128, 133, January-February 1974. 7 fig, 6 ref.

Descriptors: *Soil water movement, *Subsurface irrigation, *Infiltration, *Mathematical studies, Mathematical modeling, Irrigation systems, Irrigation, Agriculture, Model studies, Capillary conductivity.
Identifiers: *Trickle irrigation, *Drip irrigation.

Results are presented of a study of steady infiltration from a distribution of buried line sources which lie in a horizontal plane and are parallel and equally spaced. The sources simulate subsurface irrigation laterals. An analytical solution is made possible by the use of a quasilinear form of the differential flux equation and an exponential relationship between hydraulic conductivity and capillary potential of the soil modeled. The objective of the paper is to develop the analytical solution and compare the computed distributions of capillary potential for normal field lateral spacings and depths with those computed by more complex methods. (Skogerboe-Colorado State)
W76-01065

WATERHAMMER CONSIDERATIONS FOR PVC PIPELINE IN IRRIGATION SYSTEMS,
Certain-Teed-Products Corp., Valley Forge, Pa.
W. R. Seipt.
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 3, p 417-423, May-June 1974. 6 fig, 5 tab, 26 ref.

Descriptors: *Water hammer, Hydraulic conduits, Hydraulic design, Hydraulic equipment, Hydraulic structures, Irrigation design, Flow characteristics, Agriculture, Irrigation, *Irrigation systems.
Identifiers: *Polyvinyl chloride pipe.

Waterhammer pressure develops whenever flow is changed. Flow changes occur by operating valves, by starting or stopping pumps, or by sudden release of entrapped air. Its intensity depends upon the rate of change. On occasion, it damages piping. Waterhammer can be contained by: adequate design; proper installation and responsible use. (Skogerboe-Colorado State)
W76-01066

UPWARD WATER MOVEMENT IN FIELD CORES,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
L. G. Wells, and R. W. Skaggs.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. American Society of Agricultural Engineers. St. Jospeh, Michigan. 15 fig, 2 tab, 25 ref, Paper No 74-2572.

Descriptors: *Subsurface irrigation, *Soil water movement, Irrigation, Irrigation design, Irrigation systems, Hydraulic conductivity, Model studies, Soil properties.
Identifiers: Subirrigation, Richards equation, Pressure potential.

Subirrigation experiments were conducted under various initial and boundary conditions using large, undisturbed soil cores representing two field soils. Water flow volumes and pressure potential distributions were monitored continuously during each test. The desorption soil water characteristic was determined for both soils using pressure plates. The effective saturated hydraulic conductivity was determined for each core used in the experiments. The relationships between hydraulic conductivity and pressure potential, K(k), were determined for each soil type transient pressure potential measurements during a drainage event. An approximate model was developed to describe vertical water movement during subirrigation. The model assumed that the water rises uniformly in the profile, making no provision for water movement in advance of the water table. The model is capable of considering profile stratification. Also the one dimensional h-based form of the Richards equation was solved numerically for conditions corresponding to those imposed during the experiments. (Skogerboe-Colorado State)
W76-01068

HIGH RATE SPRINKLING OF A LOW INTAKE SOIL,
Agricultural Research Service, Brawley, Calif.
L. S. Willardson, B. L. Ertsgaard, C. F. Ehlig, and A. J. MacKenzie.
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 2, p 280-281, March-April 1974. 2 fig, 1 tab.

Descriptors: *Sprinkler irrigation, Irrigation practices, Irrigation operation and management, Irrigation effects, Frequency, Puddling, Soil management, Soil properties, Irrigation, Agriculture.
Identifiers: Soil crusting.

Water can be applied to low intake rate soils by sprinklin at high average application rates if water is applied intermittently and the average application rate does not exceed the average instantaneous intake rate during the interval of operation. Soil crusts formed on the soil surface when the soil dried, but these crusts did not interfere with plant growth. Greater total amounts of water can be applied without causing ponding and loss of soil surface structure by the use of short sprinkling intervals and by applying smaller amounts of water per day. For equal amounts of applied water, short duration--high frequency applications caused less loss of soil surface structure than long duration--low frequency applications. (Skogerboe-Colorado State)
W76-01069

DRIP IRRIGATION DESIGN BASED ON UNIFORMITY,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
I. Wu, and H. M. Gitlin.
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 3, p 429-432, May-June 1974. 4 fig, 5 ref.

Descriptors: *Uniformity coefficient, *Irrigation design, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Presented is a general shape of energy gradient line which can be applied to distribution and variation of emitter discharge along the lateral. A design chart is presented for determining an acceptable combination of lateral lengths and inlet pressure of a drip irrigation system. The chart helps in selecting a drip irrigation line based on a desirable or acceptable uniformity coefficient. The designer can try different combinations of pressure and length in order to obtain a design which is acceptable. (Skogerboe-Colorado State)
W76-01070

INSTALLATION CHECKS ON 4-INCH (102 MM) CORRUGATED POLYETHYLENE DRAIN TUBING,
Soil Conservation Service, Upper Darby, Pa.
D. E. McCandless, Jr.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois, Paper No 74-2543, American Society of Agricultural Engineers. St. Joseph, Michigan. 8 tab, 3 ref.

Descriptors: *Plastic pipes, Pipelines, Construction, Drainage, Drainage engineering, Drainage practices, Tubes, Sands, Clays, Gravels.
Identifiers: Corrugated tubing, Polyethylene.

Results of 54 installation checks on a 4-inch (102 mm) corrugated polyethylene drain tubing in 4 Northeastern states are reported. Checks were made by Soil Conservation Service personnel with the assistance of farmers, contractors, and manufacturers' representatives. Tubing installed in gravelsoil sites generally had deflections 2 to 5 percent higher than those in clay or sandy soils. Tubing installed in sandy soils had the least deflection and commonly ranged from 13 to 20 percent. Tubing installed in trenches 4 to 5 feet (1.2 to 5 m) deep in sandy soils was doing as well or better than tubing installed at lesser depths. Subsurface drains in the Northeast are commonly installed in trenches 1-1/2 to 4 feet (0.8 to 1.2 m) deep. With 14 percent of the sites being classified as unsatisfactory, it is obvious that in many areas of the Northeast there is a need for a training and installation program on good installation procedures for SCS personnel, contractors, and farmers. (Skogerboe-Colorado State)
W76-01071

ANHYDROUS AMMONIA APPLICATION IN IRRIGATION WATER VS. MECHANICAL AND ITS EFFECT ON CORN YIELDS,
Nebraska Univ., Dept. of Agricultural Engineering.
H. R. Mulliner, and K. D. Frank.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2567, American Society of Agricultural Engineers. St. Joseph, Michigan. 4 tab.

Descriptors: *Nitrogen, *Nitrogen compounds, *Corn, Fertilization, Fertilizers, Irrigation practices, Irrigation water, Irrigation, Irrigation effects, Plant growth, Ammonia.
Identifiers: *Anhydrous ammonia.

Application of anhydrous ammonia in surface irrigation distribution systems requires top level management. From an energy standpoint, it is more effective because optimum yields can usually be obtained with less nitrogen, and the energy for mechanical application is saved. In the manufacturing process, energy is required to convert anhydrous ammonia to ammonium nitrate and urea; thus, the ability to utilize anhydrous ammonia directly in surface irrigation systems is an additional savings of energy. Salts in the irrigation water presented no problem of encrusting inside the distribution system (aluminum gated pipe) when the inhibitor sodium polyphosphate was used. Irrigation water will carry from 50 to 110 ppm anhydrous ammonia before it is lost into the atmosphere. Keeping within these limitations is necessary for efficient application. Optimum grain yields were obtained with the application of 120 pounds of nitrogen. In 1972, grain yields were essentially the same whether anhydrous ammonia was applied in the irrigation water or applied mechanically. In 1973, water applied anhydrous ammonia gave significantly better yields than mechanically applied ammonia. (Skogerboe-Colorado State)
W76-01072

ALTERNATE-FURROW IRRIGATION OF FINE TEXTURED SOILS,
Southwestern Great Plains Research Center, Bushland, Tex.
J. T. Musick, and D. A. Dusek.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 2, p 289-294, March-April 1974. 10 fig, 1 tab, 8 ref.

Descriptors: *Furrow irrigation, *Furrow systems, Irrigation effects, Irrigation efficiency, Irrigation practices, Furrows, Crop response, Sugarbeets, Grain sorghum, Potatoes, Soil salinity, Infiltration rates, Irrigation, Agriculture, Silts, Clays, Loam.
Identifiers: Alternate furrow irrigation, Pullman soils.

Alternate-furrow irrigation of bed-furrow spacings ranging from 30 to 40 inches were evaluated for irrigating slowly permeable Pullman soils. Alternate-furrow irrigation had little effect on water intake and yields on Pullman silty clay loam but significantly reduced both intake and yields of sugarbeets and grain sorghum on Pullman clay loam. The reduction in water intake and yields was concentrated on the lower one-fourth to one-half of the field plots depending primarily on the irrigated furrow spacing and length of run. Lateral wetting extended from the irrigated furrow into the adjacent nonirrigated furrow past midfield under all conditions evaluated. Alternate-furrow irrigation of bed-furrow spacings exceeding 30 inches is not recommended on slowly permeable clay loam soils. Although alternate furrow irrigation significantly reduced size of irrigation, the concentration of this effect on the lower part of a field and associated yield reductions limits the usefulness of the practice for more efficient management and use of water. (Skogerboe-Colorado State)
W76-01073

THE EFFECT OF SOIL WATER SUPPLY ON CORN FERTILIZER RESPONSE,
Agricultural Research Service, Morris, Minnesota.
T. C. Olson, and C. A. Onstad.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 5, p 914-916, September-October 1974. 5 tab, 10 ref.

Descriptors: *Crop response, *Corn, *Soil water, *Fertilization, Rainfall, Crop production,

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Statistics, Agriculture, Agronomic crops, Moisture stress, Moisture availability, Moisture content, *Soil-water-plant relationships.

The study reported was designed to determine the possibility of estimating the optimum amount of fertilizer needed for greatest efficiency when the amount of water stored in the soil profile at planting time is known. Conversely, would increasing stored water increase the efficiency of fertilizer. Response to applied fertilizer under different levels of stored water at planting and different patterns of rainfall were studied to identify the types of interactions between water stress and fertility response by corn. Corn grain yields for six treatments are reported for each year. Significant differences as indicated by LSD are shown on an individual year basis. Annual average yields of main treatments illustrate the influence of stored water. The combined analysis of varience indicated highly significant differences in yield among years but no significant difference in overall average yields among main treatments or between fertility levels. The year x main treatment, and the year x fertility-level interactions were both highly significant (p= 0.01) and the main-treatment x fertility level x year interaction was significant at the 0.05 level. (Skogerboe-Colorado State)
W76-01075

CHAMBER METHOD OF SUBSURFACE AND DRIP IRRIGATION,
Massachusetts Univ., Amherst. Dept. of Food and Agricultural Engineering.
E. S. Pira, and K. S. Purohit.
Transactions of the (ASAE) American Society of Agricultural Engineers, Vol 17, No 2, p 282-285, March-April 1974. 6 fig, 18 ref.

Descriptors: *Design criteria, *Irrigation design, *Subsurface irrigation, *Head loss, Irrigation methods, Flow rates, Irrigation, Agriculture, Orchards, Discharge frequency.
Identifiers: *Trickle irrigation, *Furrow irrigation, *Uniformity, Drip irrigation, Chamber method.

By varying cross sectional area and length of the low pressure distribution line (chamber), uniform discharge rates can be produced through emitters. Discharge rates can be changed by adjusting chamber pressure. 'Quick-fill' is necessary to make the system practical. In other words, the chamber must be charged with water before good operation begins. Field installation in an apple orchard is discussed. (Skogerboe-Colorado State)
W76-01076

CONTROLLING CENTER PIVOT SPRINKLERS FOR EXPERIMENTAL WATER APPLICATION,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 7B.
W76-01080

FIELD LEACHING BY SPRINKLER AND SURFACE IRRIGATION DURING A CROP SEASON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 4B.
W76-01081

IRRIGATION TIMING BY THE STRESS DAY INDEX METHOD,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
E. A. Hiler, T. A. Howell, R. B. Lewis, and R. P. Boos.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 3, p 393-398, May-June 1974. 2 fig, 8 tab, 28 ref.

Descriptors: *Stress, *Stress analysis, Irrigation practices, Crop production, Optimization, Water conservation, Water requirements, Irrigation, Agriculture, Plant growth.
Identifiers: *Stress day index, *Irrigation scheduling, SDI.

A potentially useful concept for optimizing irrigation timing is the stress day index (SDI). The SDI and its components are defined and examples are used to show how this approach can be utilized for timing irrigations. Experimental findings related to use of SDI are presented. The SDI concept is formulated as the product of a crop susceptibility factor (CS) and a stress day factor (SD). Values of CS depend on species and stage of development and indicate the plant's susceptibility to a given water deficit at different growth stages. A method for determining CS is given along with quantitative values for various irrigated crops. Irrigation timing is accomplished with the SDI approach when the daily SDI (daily SD x CS for the appropriate growth stage) reaches some predetermined critical value. Basically, the water deficit indicator (SD) is weighted according to crop sensitivities at different growth stages so that reduced water deficit occurs during critical periods. (Skogerboe-Colorado State)
W76-01082

OPTIMIZATION OF WATER USE EFFICIENCY UNDER HIGH FREQUENCY IRRIGATION: II SYSTEM SIMULATION AND DYNAMIC PROGRAMMING,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
T. A. Howell, E. A. Hilder, and D. L. Reddell.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2565, American Society of Agricultural Engineers, St. Joseph, Michigan, 28 p, 3 fig, 5 tab, 17 ref.

Descriptors: *Optimization, Dynamic programming, Simulated rainfall, Simulation analysis, Monte Carlo method, *Water utilization, Irrigation practices.
Identifiers: *High frequency irrigation, System simulation.

An environmental simulation model (temperature, rainfall, and potential evaporation) was developed for Temple, Texas. Using Monte Carlo techniques, daily environmental data could be simulated for input to the soil water balance model. The simulation results adequately represented the stochastic serial-correlation of these variables. Stochastic dynamic programming was used to maximize yield, subject to water availability constraints. These results showed the proper irrigation decision for each period of the soil water content and amount of irrigation water at the start of the period were known. Finally, these results demonstrated that the irrigation amount could be substantially reduced without a large decrease in expected yield if the irrigation water was distributed optimally over the season. This study demonstrated the tremendous possibilities of applying the techniques of system simulation, dynamic programming and decision analysis to the irrigation problem. (Skogerboe-Colorado State)
W76-01083

MODELING INFILTRATION AND REDISTRIBUTION OF SOIL WATER DURING INTERMITTENT APPLICATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W76-01085

TRICKLE IRRIGATION DESIGN PARAMETERS,
Utah State Univ., Logan. Agricultural and Irrigation Engineering.
J. Keller, and D. Karmeli.
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 4, p 678-684, July-August 1974. 4 fig, 1 tab, 12 ref.

Descriptors: *Design criteria, *Irrigation design, Design flow, Flow characteristics, Irrigation, Agriculture, Irrigation efficiency.
Identifiers: *Trickle irrigation, *Drip irrigation, Emission uniformity, Trickle irrigation emitters.

Basic definitions, objectives of trickle irrigation and advantages and disadvantages are described. Formulas for computation of irrigation depth and interval, flow rates through emitters, system capacity, flow characteristics of various emitters, and emission uniformity (EU) are all presented. Lateral and manifold design are presented along with an example of system layout with complete design figures. (Skogerboe-Colorado State)
W76-01087

INVESTIGATIONS OF THE APAC WATER SEEPAGE BARRIER,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 8G.
W76-01115

AUTOMATED VALVES FOR SURFACE IRRIGATION PIPELINES,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 4A.
W76-01120

EFFECTS OF AGRICULTURE ON EROSION AND SEDIMENTATION IN THE PIEDMONT PROVINCE, MARYLAND,
Denver Univ., Colo. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W76-01266

THE ECONOMIC EFFICIENCY OF INTER-BASIN AGRICULTURAL WATER TRANSFER IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W76-01341

TRADEOFFS BETWEEN IRRIGATION SYSTEMS WITH DIFFERENT RELIABILITIES OF SUPPLY,
New South Wales Univ., Kensington (Australia). School of Economics.
N. Dudley.
In: Hydrology Symposium, Armidale Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 144-147, May 1975. 1 fig, 9 ref.

Descriptors: *Irrigation programs, *Water supply, *Reliability, *Project planning, *Economic efficiency, Irrigation design, Water requirements, Variability, Dependable supply, Storage capacity, Costs, Average income, Computer models.

A brief summary is presented of two computer-model studies and one historical analysis of reservoir-irrigation systems operating under climatic uncertainty. The results indicate that the traditional goal of designing and operating such systems so as to largely eliminate water shortages to farmers can be costly in terms of average annual net revenue foregone. That is, the tradeoffs between system designs which minimise the variance of annual net revenue from the project and those which maximise annual net revenue may be very significant. The complexity of the design considerations is emphasised. (CSIRO)
W76-01424

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE ROLE OF THE WISCONSIN DEPARTMENT OF AGRICULTURE IN AGRICULTURAL POLLUTION PREVENTION AND CONTROL,
Wisconsin Dept. of Agricultural, Madison.
For primary bibliographic entry see Field 5E.
W76-01018

RUNOFF CONTROL SYSTEMS FOR CONCRETE DAIRY CATTLE YARDS,
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
For primary bibliographic entry see Field 5B.
W76-01039

FIELD PERFORMANCE OF SELECTED BEEF FEEDLOT WASTE HANDLING SYSTEMS,
Illinois Univ., Urbana-Champaign.
For primary bibliographic entry see Field 5E.
W76-01040

A CHARACTERIZATION OF THE EFFLUENT FROM COMMERCIAL CATFISH PONDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-01041

BIOLOGICAL TREATMENT OF FEEDLOT RUNOFF FOLLOWING SETTLING,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-01042

CATTLE FEEDLOT POLLUTION STUDY,
Texas Tech. Univ., Lubbocks. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W76-01045

ASSESSMENT OF MODELS SUITED FOR THE HYDROLOGICAL ANALYSIS OF URBAN STORM DRAINAGE (A VAROSI CSAPADEK CSATORNAZASI HIDROLOGIAI SZAMITASRA ALKALMAZOTT MODELLEK ERTEKELESE).
I. Wisnovszky.
Hidrologiai Kozlony, Vol. 52, No. 10, p 443-445, October, 1972. 7 ref.

Descriptors: *Model studies, *Storm runoff, *Urban runoff, Cities, Drainage systems, Computers.
Identifiers: Narayana-Riley model, Tholin-Keifer model.

Models for the analysis of urban storm water runoff are evaluated. In its present state, the Rational Formula is not adaptable to urban runoff conditions and must be modified for this specific use. The Tholin-Keifer model, developed originally for Chicago redevelopment programs, can be adapted to other urban conditions since the dimensioning of the drainage system is based on the most probable form of precipitation distribution with respect to time. Finally, the computerized Narayana-Riley model, operating with regression analysis for the determination of relationships between area characteristics and specific runoff load, constitutes a generally applicable design procedure. (Sandoski-FIRL)
W76-01052

INFILTRATION MODEL WITH REGARD TO THE SURFACE RUNOFF (EIN INFILTRATIONSMODELL UNTER BERUECKSICHTIGUNG DES LANDOBERFLAECHENABFLUSSES),
For primary bibliographic entry see Field 2A.
W76-01053

MATHEMATICAL MODEL FOR THE FILLING PROCESS OF THE RETENTION BASIN STOEHNA (MATHEMATISCHES MODELL FUER DEN FUELLVORGANG DES HOCHWASSER-RUECKHALTEBECKENS STOEHNA),
For primary bibliographic entry see Field 2E.
W76-01054

TOWARDS RATIONAL DRAINAGE DESIGN,
A. J. Wilson, and A. L. Britch.
Building Science, Vol 8, No 1, p 23-26, March, 1973. 4 fig, 6 ref.

Descriptors: *Model studies, *Sewerage, *Drainage systems, Flow rates, Costs, Pipes, Excavation, Algorithms.
Identifiers: Flow estimation.

A simple, rational, and effective algorithm developed for use in estimating flows expected in any sewer drainage system is shown over extensive tests to behave well and give reliable and apparently accurate results which compare very favorably with those obtained by other methods. Comparative results indicate that previous techniques of flow estimation are unnecessarily conservative, and further it is to be expected that use of this approach would result in significant economic benefits since decreased design flow means smaller diameter pipes and decreased gradients necessitating less excavation. At the present time, large scale tests are being planned with the dual purpose of testing the accuracy of the flow predicted by the program and to obtain more accurate empirical data on the discharge characteristics of the different types of equipment upon which the program depends. (Sandoski-FIRL)
W76-01061

CONCEPTUAL MODEL DESIGN FOR MOTORWAY STORMWATER DRAINAGE,
For primary bibliographic entry see Field 2A.
W76-01062

EFFECTS OF INUNDATION PERIOD ON SEEDLING GROWTH,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
T. A. Howell, and E. A. Hiler.
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 2, p 286-288 and 294, March-April 1974. 5 fig, 1 tab, 11 ref.

Descriptors: *Drainage effects, *Drainage practices, Drainage, Crop response, Corn, Cotton, Grain sorghum, Lysimeters, Aeration, *Flooding, *Plant growth, Flood damage, Submergence, Wetting.
Identifiers: Peas, Seedling growth, Inundation.

In considering the necessary steps for proper agricultural drainage design, the logical first step is the determination of the crop's drainage requirement. Rindings concerning effects of inundation period on soil oxygen diffusion rates and crop response during the seedling growth of four selected plant species are presented. Corn, cotton, grain sorghum, and southern pea plants were grown for 30 days in field lysimeters which were inundated for periods of 2, 5, and 8 days, starting approximately 1 week after emergence. Undisturbed soil cores which were 90 cm in diameter and 180 cm deep made up the lysimeters. Rainfall was kept off the lysimeters with an automated shelter system. Oxygen diffusion rate and soil water pressure potential measurements were made in the crop root zone on a regular basis. Primary crop response measurements included crop height during the growing season and dry matter yield at the end of the growth period. Water was added at the soil surface to maintain the soil water pressure potential in the crop root zone between -10 and -20 centibars, and hence prevent crop water stress, during periods when no flooding occurred. (Skogerboe-Colorado State)
W76-01084

MODELING INFILTRATION AND REDISTRIBUTION OF SOIL WATER DURING INTERMITTENT APPLICATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W76-01085

AUTOMATED VALVES FOR SURFACE IRRIGATION PIPELINES,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
A. S. Humpherys, and R. L. Stacey.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR2, p 95-109, June, 1975. 15 fig, 3 ref, append.

Descriptors: *Hydraulic valves, *Distribution systems, *Irrigation engineering, *Surface irrigation, *Flow control, Automation, Irrigation systems, Pipes, Water distribution(Applied), Irrigation practices, Irrigation design, Irrigation operation and maintenance, Conveyance structures, Irrigation, Water delivery, Operating costs, Water control, Irrigation efficiency, Design criteria.

Automatic irrigation valves have been developed to control the discharge from a field pipeline turnout into either gated pipe or directly into irrigation borders, Design information for 6-inch, 8-inch and 10-inch valves is given. Two types of water-inflatable bladders are used to open and close the valves which are designed to operate with water from the irrigation pipeline at pressures up to approximately 12 pounds per sq inch. Small 3-inch pilot valves, operated by a 3 volt dc battery powered motor, are used to control opening and closing of the irrigation valves. This motor/pilot-valve unit can be used with mechanical and electronic timers, commercial irrigation controllers, or radio transmitter/receiver units. (Robinett-Arizona)
W76-01120

INTERACTION OF CALCIUM AND 2,4-D ON EURASIAN WATERMILFOIL,
Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
R. A. Stanley.
Weed Science, Vol 23, No 3, p 182-184, 1975. 3 fig, 1 tab, 34 ref.

Descriptors: *Calcium, *Herbicides, *2,4-D, Root systems, Growth rates, Inhibition, Hardness(Water), Tennessee, Rates of application, Aquatic weed control.
Identifiers: Eurasian watermilfoil.

The effect of calcium on treatment of Eurasian watermilfoil (Myriophyllum spicatum) with 2,4-D was determined. Shoot and root growth and length were inhibited less by 2,4-D in soil lacking calcium. With 30-day exposures to 2,4-D, calcium had to be added to distilled water in concentrations corresponding to those in hard water to produce maximum herbicidal responses. At lower calcium levels, equivalent to soft water, herbicidal response was about the same as in distilled water. When watermilfoil was exposed to 2,4-D for two days, then grown in hard water so uptake and growth were temporarily separated, root inhibition was proportional to calcium chloride concentra-

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tion during 2,4-D uptake. As little as 0.1 mM calcium chloride facilitated growth inhibition by 2,4-D. Differences in field treatment effectiveness were calculated to be 48% greater at the highest natural calcium concentrations than at the lowest calcium concentrations in water of the Tennessee Valley. Effective field treatment rates with 2,4-D could be varied over a two-fold range depending on calcium concentration at time of treatment. Water samples should be analyzed for calcium before treatment and rate of application adjusted accordingly. (Buchanan-Davidson--Wisconsin)
W76-01141

FLOODS IN EASTERN LAJAS VALLEY AND THE LOWER RIO LOCO BASIN, SOUTHWESTERN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 2E.
W76-01182

FLOODS IN LOMBARD QUADRANGLE, ILLINOIS,
Geological Survey, Champaign, Ill.
For primary bibliographic entry see Field 2E.
W76-01183

FLOODS IN THE CAROLINA-RIO GRANDE AREA, NORTHEASTERN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 2E.
W76-01185

MAP SHOWING FLOOD-PRONE AREAS, GREATER DENVER AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W76-01186

MAP SHOWING FLOOD OF APRIL 1975 AT EAST LANSING, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 2E.
W76-01188

MAP SHOWING FLOOD OF APRIL 1975, LANSING, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 2E.
W76-01189

MAP SHOWING FLOOD OF APRIL 1975 AT WILLIAMSTON, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 2E.
W76-01190

COMPUTER PROGRAM FOR DRAINAGE QUANTITIES,
For primary bibliographic entry see Field 4C.
W76-01285

ADAMS COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 7C.
W76-01317

HENDERSON COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 7C.
W76-01318

APPROACHES TO MULTIOBJECTIVE PLANNING IN WATER RESOURCE PROJECTS,
Virginia Polytechnic Inst and State Univ., Blacksburg. School of Business Administration.
For primary bibliographic entry see Field 6A.
W76-01335

MODELING OF FUTURE EXPENDITURES FOR PLANNING AND ECONOMIC EVALUATION OF ALTERNATIVES,
For primary bibliographic entry see Field 6A.
W76-01336

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES,
Iowa Univ., Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 6A.
W76-01338

THE ECONOMIC EFFICIENCY OF INTERBASIN AGRICULTURAL WATER TRANSFER IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
J. E. Keith, J. C. Andersen, and C. G. Clyde.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-001-076. $6.00 in paper copy, $2.25 in microfiche .AD/A-001 076. Supp 3 to IWR Contract Report 74-4, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, June 1973. 136 p, 21 fig, 15 tab, 40 ref, 8 equ, 5 append.

Descriptors: *Inter-basin transfers, *Economic efficiency, *Utah, *Water supply, *Water allocation(Policy), *Water resources development, *Alternative planning, *Long-term planning, Regional analysis, Marginal costs, Value, Water policy, Computer models, Demand, Net profit, Investment, Constraints, Equations, Systems analysis, River basins, Municipal water, Industrial water, Optimization.
Identifiers: *Agricultural water, Profit maximization, Mathematical programming.

This paper examines the efficient allocation of water in Utah in time frames up to 2020 under various alternative assumptions and calculates the cost of alternative policies. Using mathematical programming, a computer model is developed to determine the supply (marginal cost) and demand (value of marginal product) relationships for agricultural water, given depletions for municipal and industrial (MandI) and wetland requirements. The model maximizes net profit per acre to an average agriculturalist in each of ten study areas in Utah. Proposed interbasin transfers and their costs are included in supply. The optimal solution generated is an efficient allocation, since maximization of net profits occurs only when value of marginal product equals marginal cost. The requirements for MandI water are projected into the future using trending and probable industrial development. Using alternative assumptions about policies (minimum inflows to Great Salt Lake and water salvage), several alternative temporal distributions are determined. The critical factor in large proposed water transfers in Utah appears to be the growth of MandI requirements along the Wasatch Front, particularly in the Jordan River Basin. Sufficient water is available in the Colorado River Basin to provide maximum transfers, full oil shale and power generation development, and efficient agricultural production. Restrictions on groundwater pumping and water salvage in the Jordan River Basin and maintenance of high inflows to Great Salt Lake make earlier transfer necessary. (Bell-Cornell)
W76-01341

ENVIRONMENTAL RECONNAISSANC TECHNIQUES FOR CONNECTICUT RIVE BASIN WATERSHEDS,
Center for the Environment and Man Inc , Hartford, Conn
For primary bibliographic entry see Field 4D
W76-01344

NONSTRUCTURAL MEASURES FOR FLOO PLAIN AND FLOOD DAMAGE MANAG MENT, WITH APPLICATION TO THE CO NECTICUT RIVER BASIN SUPPLEMENTA FLOOD MANAGEMENT STUDY,
Cheney, Miller, Ellis and Associates, Inc., Pnam, Conn.
For primary bibliographic entry see Field 6F.
W76-01345

LAND-CAPABILITY CLASSIFICATION THE LAKE TAHOE BASIN, CALIFORNI NEVADA, A GUIDE FOR PLANNING,
Forest Service (USDA), Ogden, Utah. Intermoutain Forest and Range Experiment Station.
R. G. Bailey
Prepared in cooperation with the Tahoe Regio Planning Agency. 1974 33 p, 13 fig, 1 map, 66 r append.

Descriptors: *Land classification, *Land u *Land development, *Land management, *S types, Erosion, Drainage, Hydrologic properti Geomorphology, Planning.
Identifiers: *Lake Tahoe(Calif), *La Tahoe(Nev).

Since the late 1950's the Lake Tahoe Basin, cov ing 500 square miles, has been subjected to ra development which has been responsible for ma improper land development procedures, includi failure to recognize hydrologic and topograp limitations, unnecessary destruction of vege cover, realignment and pollution of streams, e croachment on flood plains, and disruption drainage. This study classified the land accordi to 'land tolerance' as a measure of capabil which is defined as a level of use an area c tolerate without sustaining permanent dama through erosion and other causes. The capabil classes are estimated by the degree to whi potential hazards arising from improper use a absent. Principal factors used in distinguishing t seven land capability ranks shown on the final m were: Soil Type (along with erosion hazar hydrologic-soil group, soil drainage and rockine and stoniness); and Geomorphic Setting includi 6 groups: glaciated granitic uplands, glaciated v canic flowlands, streamcut granitic mounta slopes, streamcut volcanic flowlands, deposition lands, and oversteeped slopes. The 7 classes f into 3 general categories each with implications f land use: High hazard lands, lands that shou remain in their natural condition; moderate haza lands, lands that are permissive to certain uses b not others; and low hazard lands, lands that a most tolerant to urban-type uses. In addition ea of the classes is given a single numerical index i dicating the percentage, ranging from 1 to 30 pe cent, of the land which can be used for impervio cover if environmental balance is to be mai tained. (Smith-North Carolina)
W76-01346

PRIORITIES IN WATER MANAGEMENT.
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W76-01347

ENVIRONMENTAL HAZARDS OF LARG SCALE WATER DEVELOPMENTS,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6G.
W76-01348

BENEFIT-COST ANALYSIS AND MULTIPLE-PURPOSE RESERVOIRS: A REASSESSMENT OF THE CONSERVATION AUTHORITIES' BRANCH DEER CREEK PROJECT, ONTARIO,
University of Western Ontario, London.
For primary bibliographic entry see Field 6B.
W76-01349

NEW STRATEGIES FOR WATER RESOURCE PLANNING AND MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md.
S. H. Hanke, and R. K. Davis.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 117-139, 4 tab, 19 ref. 1974.

Descriptors: *Water control, *Water management(Applied), *Water costs, *District of Columbia, *Water demand, *Pricing, *Potomac River, *Droughts, Water distribution(Applied), Administration, Non-structural alternatives, Water supply development, Cost-benefit analysis, Pumping, Model studies.
Identifiers: *Washington, D.C., Estuary pumping, Drought losses, Minimum storage system, Department of the Interior's 1980 system, Council of Government's Board of Engineers' 2010 system, Seasonal models.

Using the District of Columbia metropolitan area, this paper analyzes problems of water resource planning and management in terms of incremental costs and values and investigates pricing policy as an alternative to technical solutions. Four proposed storage systems in the Potomac River Basin made up of different components and producing drought protection of various kinds and degrees were tested for hydraulic performance. Total annual costs were estimated as follows: minimum storage plus acceptance of some drought losses, $1.7 million; minimum storage plus estuary pumping to meet moderate drought conditions, $.54 million; Department of Interior 1980 plan for average withdrawal plus some peaking capacity of flow to estuary, $2.6 million; Council of Governments 2010 plan for daily withdrawal plus peaking capacity in July and August, average estuary flow, $5.1 million. Under the 1980 and 2010 systems, cost apportionments faced by local governments are so small that local policy-makers can officially advocate a larger system than can be economically justified. Preferred allocation of costs assigns costs in direct proportion to benefits received. Projects having local benefits should be paid for by local governments. When costs are not shared with the federal government both of the unconventional minimum storage alternatives (drought losses and estuary pumping) rank ahead of proposed 1980 and 2010 projects in terms of real resources that must be foregone to produce any projects. Demand management through seasonal pricing is discussed. In Washington, D.C., seasonal (winter and summer) water rates accurately reflect the system costs imposed by various users over the year. By implementing these seasonal rates, the proposed investments in capacity could be deferred at a significant saving. (See also W76-01347) (Hufschmidt-North Carolina)
W76-01354

WATER MANAGEMENT AND PRICING POLICIES IN ENGLAND AND WALES,
London School of Economics and Political Science (England).
For primary bibliographic entry see Field 6B.
W76-01356

MANAGEMENT OF THE INTERNATIONAL GREAT LAKES,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6E.
W76-01358

THE ROLE OF THE ACADEMIC IN WATER RESOURCES POLICY-MAKING: THE TIJUANA RIVER, A CASE STUDY,
California State Univ., San Diego.
For primary bibliographic entry see Field 6B.
W76-01359

SPECIAL FLOOD HAZARD REPORT: CAMPBELL CREEK, GREATER ANCHORAGE AREA.
Army Engineer District, Anchorage, Alaska.
Prepared for the Greater Anchorage Area Borough, May, 1975. 18 p, 28 plates, 3 tab.

Descriptors: *Floods, *Flooding, *Flood flow, *Flood forecasting, *Flood profiles, Surface runoff, Peak discharge, Bank erosion, Flood damage, Ice jams, Glaciation, Warning systems, Control structures, *Alaska, Floodways.
Identifiers: Anchorage(Alaska), Greater Anchorage Area Borough(Alaska), Campbell Creek(Alaska), Little Campbell(Alaska), Intermediate Regional Flood.

The area covered in this report has a drainage area of 126 sq mi and includes the main stem of Campbell Creek, the north and south forks of Campbell Creek to the military reservation boundary, and Little Campbell Creek to the foothills of the Chugach Mountains. Continuing commercial and extensive residential development of the area is contributing to the danger of flooding by removing vegetation (which formerly reduced runoff) and necessitating the construction of culverts which tend to clog during flood conditions. The Greater Anchorage Area Borough has a program for installing larger culverts in troublesome areas, a flood warning system, and a zoning ordinance which is under consideration. Flooding can occur during any season. Winter flooding results from the effects of glaciation; spring floods result from snowmelt and ice conditions; summer floods result from heavy rainfall. An Intermediate Regional Flood on Campbell Creek would have a peak discharge of 1320 cubic feet per second with channel velocities of up to 10 ft/sec and overbank flows of less than 3 ft/sec. Damage from an IRF could include broken water lines, bank erosion, and the effects of floating debris. Flood profiles include a hydraulic floodway added to limits of the IRF. (Henley-North Carolina)
W76-01361

FLOOD PLAIN INFORMATION: ALISO CREEK, ORANGE COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
Prepared for Orange County Flood Control District, March, 1973. 35 p, 26 fig, 42 plates, 6 tab.

Descriptors: *Floods, *Flood profiles, *Flood data, *Flood plains, Runoff, Flood flow, Streamflow forecasting, Peak discharge, Flood peak, Flood damage, Stream erosion, Bank erosion, Obstructions to flow, Zoning, Channel improvement, *California.
Identifiers: *Aliso Creek(Calif), Wood Canyon Creek(Calif), Sulphur Creek(Calif), English Canyon Creek(Calif), *Orange County(Calif), Standard Project Flood, Intermediate Regional Flood.

Properties along the streams in the vicinity of Laguna Hills studied are primarily agricultural and have been moderately damaged by floods in January and February 1969. Extensive open spaces in the flood plains are now under pressure for future development. Orange County has adopted a flood plain zoning ordinance regulating areas subject to flooding. Large floods have occurred in the past and studies indicate that even larger floods are possible. The drainage area of Aliso Creek is approximately 36 miles and the slope of the creek is 125 feet/mile upstream from the study area and about 25 feet/mile downstream, nearer to the Pacific Ocean. Streamflow data have been available since 1932. Most flooding has been caused by high-intensity rainfall associated with general winter storms. Annual precipitation over the basin averages 15 inches, with major portion between December and March. Extreme peaks can be reached in a matter of hours, rising from nearly dry streambeds. Most of the 12 public bridges and culverts crossing the stream would be obstructive to the Intermediate Regional Flood and even more obstructive to the Standard Project Flood. The most destructive flood on record, that of February 1969, caused damage estimated at $604,000 to mainly roads and bridges and agricultural land. This flood has a discharge of 2500 cfs. It is estimated that an Intermediate Regional Flood would have a discharge of 3800 cfs and a Standard Project Flood would have a discharge of 7500 cfs, measured at the streamflow gage. (Smith-North Carolina)
W76-01362

SPECIAL FLOOD HAZARD INFORMATION: BEAR AND EVANS CREEKS, REDMOND AND VICINITY, WASHINGTON.
Army Engineer District, Seattle, Wash.
Prepared for the City of Redmond and King County, Wash., Novemeber, 1970. 8 p, 12 plates.

Descriptors: *Flood plains, *Flood damage, *Flood profiles, *Flood data, Land use, Planning, Peak discharge, Obstruction to flow, Flood plain zoning, *Washington, Urbanization.
Identifiers: Bear Creek(Wash), Evans Creek(Wash), Cottage Lake Creek(Wash), Seattle(Wash), Intermediate Regional Flood, Flood plain management.

Bear Creek and its two principal tributaries, Evans and Cottage Lake Creeks, have well-defined channels through the study reach near Redmond, Washington, except in the extreme upper reach of Evans Creek. Moderately rolling semiforested side hills border the irregular valleys. The lower section of the Bear Creek-Evans Creek valley is used primarily for farming. Further upstream principal development is residential. Because of the area's proximity to Seattle, future expansion pressures are certain to prevail throughout the basin. Flood season is from October to March. Melting snow may augment rainstorm flooding. There are 43 bridges in the study area where debris may collect and increase extent of flooding. The largest recorded streamflow at the gaging station at Bear Creek occurred in March, 1950, at 654 cfs; at Evans Creek in January, 1965, at 146 cfs; and at Cottage Lake Creeks in January, 1956, at 132 cfs. Intermediate Regional Flood (IRF) discharges were determined from an analysis of past floods and include an adjustment to reflect anticipated future, 40% development of Bear Creek Basin. At the confluence of Bear and Evans Creeks, IRF peak discharge would be 1450 cfs. Flood occurrences greater than the IRF were not investigated. (Diefendorf-North Carolina)
W76-01363

FLOOD PLAIN INFORMATION: EIGHT MILE CREEK, VICINITY OF PARAGOULD, ARKANSAS.
Army Engineer District, Memphis, Tenn.
Prepared for the City of Paragould, August, 1971. 31 p, 11 fig, 14 plates, 3 tab.

Descriptors: *Flooding, *Flood flow, *Flood water, *Flood forecasting, *Flood profiles, *Flood peak, *Peak discharge, Historic floods, Storms, Flood frequency, Flood damage, Creeks, Flow duration, *Arkansas.
Identifiers: Paragould(Ark), Greene County(Ark), Eight Mile Creek(Ark), Standard Project Flood, Intermediate Regional Flood.

The portion of Eight Mile Creek covered in this report has a reach length of 9.65 miles and drain 168 square miles in the areas of Paragould, located on the eastern slope of Crowley's Ridge in northeast Arkansas. Commercial, industrial, and residential

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development in the flood plain is susceptible to flood damage. Duration of flooding can be expected to be relatively short. In this study area the creek has a slope of 7.5 ft/mile. There are no flood control measures or flood warning systems. Flood control improvements on Eight Mile Creek will be considered as a part of the St. Francis River Basin study. Information gained from newspaper files and local residents indicates that large floods on Eight Mile Creek in the Paragould Vicinity have occurred in 1937, 1945, 1957, and 1969. The flood in January, 1969 caused extensive damage ($1 million) to some business concerns and resulted in the evacuation of some 25-30 families. An Intermediate Regional Flood on Eight Mile Creek can be expected to flow at 10,800 cfs at the lower study limit with velocities of 5.8 and 1.7 feet per second in the channel and overbank areas, respectively, and reach a height 0.7 to 1.5 ft higher than the 1969 flood. A Standard Project Flood will flow at 27,700 cfs at lower study limit with velocities of 8.1 and 2.4 ft/second in the channel and overbank areas, respectively, and reach a height from 2.2 to 4.3 ft higher than the 1969 flood. (Henley-North Carolina)
W76-01364

FLOOD PLAIN INFORMATION: PART I - BAYOU BARTHOLOMEW AND TRIBUTARIES, CITY OF PINE BLUFF, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
Prepared for the City of Pine Bluff, Arkansas, November, 1973. 28 p, 15 fig, 25 plates, 8 tab.

Descriptors: *Floods, *Indirect flood measurement, *Flood stages, Flood flow, *Flooding, *Flood forecasting, *Flood profiles, Historic floods, Storms, Flood data, Flood peak, Peak discharge, Flood damage, Warning systems, Control structures, *Arkansas, Canals.
Identifiers: Pine Bluff(Ark), Jefferson County(Ark), Bayou Bartholomew(Ark), Ouachita River(Ark), Standard Project Flood, Intermediate Regional Flood.

Development in the flood plains of Bayou Bartholomew and its tributaries, Nevins Creek, Pine Bluff, Outlet Canal, Interceptor Canal, Harding Drain, and Boggy Bayou, includes residential, agricultural, industrial and commercial uses. Development of these flood plains is expected to be minor because there is adequate land for these uses outside the flood plain. The drainage area covered in this report consists of 86 square miles with stream slopes ranging from 3.5 ft/mi in the hill areas to .5 ft/mi in the alluvial valley. Streamflow data were measured by 4 gages in the Bartholomew Bayou study area. Prolonged periods of rain in winter and spring and thunderstorms in the summer months create flooding. Heavy vegetation and many of the 98 bridges which cross streams in the area are capable of obstructing flood flows. On Bayou Bartholomew, the Intermediate Regional Flood would have a peak discharge of 7,130 cfs, channel velocities of up to 6 ft/sec, with flooding of residential, commercial, and industrial sectors of Pine Bluff. A Standard Project Flood would have a peak discharge of 17,200 cfs. Flood control measures include building the Interceptor Canal, enlarging of the Pine Bluff Outlet Canal in 1954, and maintaining an ongoing program of clearing existing ditches, drains, and culverts. There are no city or county zoning ordinances or building codes specifically intended to reduce flood damage. Flood control problems will receive attention as part of a Water Management Study presently being undertaken by the Corps of Engineers. (Henley-North Carolina)
W76-01365

SPECIAL FLOOD HAZARD INFORMATION: WOLF LODGE CREEK AND TRIBUTARIES, VICINITY OF COUER D'ALENE, IDAHO.
Army Engineer District, Seattle, Wash.
Prepared for Kootenai County, Idaho, December, 1971. 8 p, 1 fig, 8 plates.

Descriptors: *Flood plains, *Planning, *Flood plain zoning, *Floodway, Erosion, Flood damage, Obstruction to flow, Flood profiles, Flood data, Land use, *Idaho, Flood stages, Lake stages.
Identifiers: Wolf Lodge Creek(Idaho), Kootenai County(Idaho), Coeur d'Alene Lake(Idaho), Wolf Lodge Bay, Flood plain management, Intermediate Regional Flood.

This report is intended to provide the basis for further study and planning by Kootenai County to minimize damages caused by flooding of Wolf Lodge Creek. The well-defined creek drains forested foothills and empties into Wolf Lodge Bay, an arm of Coeur d'Alene Lake. In the steeper reaches it carries a heavy load of gravel. Spring is the major flood season. Floods are caused primarily by melting snow, and some are augmented by heavy rains. There are numerous natural and man-made obstructions to flood flow. At the mouth, peak discharge of an Intermediate Regional Flood would be 4250 cfs and channel velocities would range from 1 to 10 feet per second. The higher velocities are sufficient to cause bank erosion. Coeur d'Alene Lake affects stream stages on the lower 1.7 miles of the creek. Maximum flooding conditions occur when the lake stage is high at the time of peak flows on the creeks. The flood plain is used primarily for farming, although there is some residential development, including a trailer park which is subject to inundation. Recommended are utilization of land use zoning measures and establishment of a hydraulic floodway and floodway fringe. (Diefendorf-North Carolina)
W76-01367

FLOOD PLAIN INFORMATION: POCOSHOCK AND POCOSHAM CREEKS, CITY OF RICHMOND AND CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
Prepared for Chesterfield County, Virginia, July, 1971. 41 p, 10 fig, 8 plates, 12 tab.

Descriptors: *Floods, *Flooding, *Flood profiles, *Flood plain, Flood control, Flood protection, Water management(Applied), *Virginia.
Identifiers: Pocoshock Creek(Va), Pocosham Creek(Va), Richmond(Va), Chesterfield County(Va), Intermediate Regional Flood, Standard Project Flood.

Pocoshock Creek flows into Falling Creek about 6.4 miles from the confluence of Falling Creek with the James River. Pocosham Creek, a tributary, flows into Pocoshock Creek at about river mile 0.9 on Pocoshock Creek. Average slopes on Pocoshock and Pocosham Creeks are 19.2 feet per mile and 34.7 feet per mile respectively. Only a small amount of residential development lies on the flood plain. There is no record of houses being flooded. The main flood season is during the summer and fall resulting from intense local thunderstorms or tropical storms. Also, flooding occurs in any season from combination of heavy rainfall lasting several days and the increased runoff resulting from development of the drainage area. Primary obstructions to flow include bridges, highway fills and natural obstructions. No flood control measures exist except for a county-required flood study before approving subdivision and site development plans. No stream flow records exist, therefore flood data were determined by highwater marks and personal interviews. Most recent flood was in August, 1969. An Intermediate Regional Flood (IRF) would be 4 to 6 feet higher than the August 1969 flood while a Standard Project Flood would be 1 to 5 feet higher than an IRF. (Salzman-North Carolina)
W76-01368

FLOOD PLAIN INFORMATION: CASPER, WYOMING, VOLUME III, NORTH PLATTE RIVER.
Army Engineer District, Omaha, Nebr.
Prepared for City of Casper, Wyoming, March, 1973. 27 p, 16 fig, 13 plates, 5 tab.

Descriptors: *Flood plain, *Flood control, *Flo protection, *Flooding, *Flood profiles, *Flo forecasting, *Wyoming, Flood frequency, Histo ic floods.
Identifiers: Casper(Wyo), *North Plat River(Wyo), Intermediate Regional Flood(IRF Standard Project Flood(SPF)

Within the 19.8-mile study reach of the Nor Platte River at Casper, Wyoming, there has be no severe flood recorded, but the potential for highly destructive flood exists. Development h been allowed to locate in the flood plain since t original settlement of the area and present flo plain development includes all types of land use the various municipalities. Past floods have n created substantial damage at Casper due to t large channel capacity, the minimal use of lo grounds adjacent to the stream, and the absence a major flood-producing storm. June, 1931 was t major flood of record in excess of the 7000 c channel capacity, with a peak discharge of 12,7 cfs. Flows at Casper are partially regulated three reservoirs, and additional damage protecti is provided by establishment of flood channel zo ing in Casper. Flood projections include the Inte mediate Regional Flood (IRF) with a pe discharge of 14,400 cfs and the Standard Proje Flood (SPF) with a corresponding peak dischar of 43,000 cfs at a point downstream of Casp Creek. The IRF constitutes a relatively sm damage hazard with minimal present developme in the flood area where all bridges are above t IRF level. The SPF would cause great damage residential, commercial, industrial, and municip developments. (Park-North Carolina)
W76-01369

FLOOD PLAIN INFORMATION: ST. JOE AN ST. MARIES RIVERS, CITY OF ST. MARI AND VICINITY, IDAHO.
Army Engineer District, Seattle, Wash.
Prepared for Benewah County and the City of S Maries, June, 1973. 27 p, 10 fig, 13 plates, 5 tab.

Descriptors: *Flood plains, *Flood plain zonin *Land use, *Flood profiles, Planning, Floo damage, Flood data, Obstruction to flow, Levee Historic floods, *Idaho.
Identifiers: St. Joe River(Idaho), St. Mari River(Idaho), St. Maries(Idaho), Flood pla management, Benewah County(Idaho), Inte mediate Regional Flood.

The wide fertile flood plain of St. Joe River is i tensively farmed with residential, commercial an industrial development, the primary industry beir lumber and wood products. The valley of St. M ries River, a major tributary which has its co fluence with the St. Joe near the city of St. Marie is narrower and devoted primarily to nonintensiv agriculture. Most frequent flooding occurs fro snowmelt during the spring. However, the greate known floods have occurred in the winter an resulted from excessive rainfall and mild temper tures. Floods rise slowly and remain out of banl for a long period. The greatest recorded flood o curred December 1933, reaching 2140.8 ft, mea sea level datum, 1 1/2 feet higher than an Inte mediate Regional Flood (IRF) is expected to be the confluence of the 2 rivers. Obstruction cause by 4 bridges and logs stored on the flood plai could increase flood heights. About 17 miles o levees have been constructed along the lower S Joe, and a 2 1/2 mile long levee and bulk hea system protects the city of St. Maries from flood of the magnitude of the IRF. However, floo flows during an IRF would cover a large portion o the valley including the municipal airport, sewag lagoons, roads, and residences. (Diefendorf-Nort Carolina)
W76-01370

SPECIAL FLOOD HAZARD REPORT: TO REVISE FLOOD PLAIN INFORMATION METROPOLITAN REGION, DENVER

COLORADO; VOLUME II: SAND, TOLL GATE AND LOWER CHERRY CREEKS, SOUTH PLATTE RIVER BASIN.
Army Engineer District, Omaho, Nebr.
Prepared for Denver Regional Council of Governments and Urban Drainage and Flood Controls District, July, 1971. 21 p, 12 photos, 1 tab, 7 plates.

Descriptors: *Flood plains, *Flood damage, *Planning, *Dams, *Flood profiles, *Cloudbursts, Land use, Flood data, Historic floods, Obstruction to flow, Urbanization, *Colorado, Levees.
Identifiers: South Platte River Basin(Colo), Sand Creek(Colo), Toll Gate Creek(Colo), Cherry Creek(Colo), *Denver(Colo), *Flood plain management, Cherry Creek Dam(Colo), Intermediate Regional Flood, Standard Project Flood.

Cherry Creek channel is alluvial, flat-bottomed, and follows a meandering course, sloping downstream from Cherry Creek Dam at 25 ft/mi, with some channel improvements between the dam and Havana Street. Sand Creek has been improved by channel realignment while portions of Toll Gate Creek improved during interstate highway construction. Cherry Creek study reach is highly urbanized and is crossed by 38 bridges which can obstruct flood flow. Sand Creek and Toll Gate Creek are less urbanized, crossed by 17 and 5 bridges respectively. A zone of frequent cloudbursts over highlands at 6,000 to 7,000 feet covers major portions of these basins. Cloudburst storms cause floods from March through August. The Cherry Creek Reservoir impounded a flood which had a peak inflow of 58,000 cfs in June, 1965, the greatest known are flood, saving an estimated $130 million in flood damages downstream. At Toll Gate Creek, flow was estimated to be 17,000 cfs, and at Sand Creek it was 18,900 cfs. Their flooding caused extensive damages, destroying nearly every bridge crossing. At the mouths of Cherry, Sand, and Toll Gate Creeks, discharges of an Intermediate Regional Flood would be 10,900 cfs, 49,500 cfs, and 21,900 cfs respectively, and of a Standard Project Flood, 21,200 cfs, 91,200 cfs, and 31,700 cfs. (Diefendorf-North Carolina)
W76-01371

FLOOD PLAIN INFORMATION: PROCTORS CREEK, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
Prepared for the Chesterfield County Board of Supervisors, September, 1973. 26 p, 6 fig, 13 plates, 8 tab.

Descriptors: *Floods, *Flooding, *Flood control, *Flood protection, Flood profiles, Flood plains, *Virginia.
Identifiers: *Proctors Creek(Va), Chesterfield County(Va), Standard Project Flood, Intermediate Regional Flood.

Proctors Creek, located in the eastern part of Chesterfield County, south of Richmond, Virginia, flows 7 miles before emptying into the James River. It drains 18.65 square miles and slopes about 21.5 feet per mile. Although channels are clear of vegetation, overbank areas are highly vegetated with trees and brush which would cause obstruction to flood flow. Development in the Proctors Creek flood plain is sparse but it is subject to increasing pressures of growth and development. Although no stream gage record for Proctors Creek exists, data collected from similar streams in the vicinity indicate that floods occur during all seasons, although larger floods resulting from hurricanes occur between May and November. Floods occur from heavy general rainfall and rise to flood peaks in a relatively short time. The duration of flooding varies from less than a day to a couple of days depending on rainfall duration. No flood damage reduction measures exist although flood studies are required before approving subdivision and site development plans. The largest flood occurred on July 18, 1945. The latest flood was July 23, 1969. An Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) would inundate much of the flood plain with estimated peak discharges of 10,920 cfs and 18,730 cfs respectively at the mouth. During the SPF, main channel velocities will average about 5.2 ft/sec with 14.8 ft/sec being about the maximum. Overbank flows will average about 2.1 ft/sec with 5.8 ft/sec as a maximum. Slightly lower velocities may be expected for the IRF. (Salzman-North Carolina)
W76-01372

FLOOD PLAIN INFORMATION: SAN LORENZO RIVER, BOULDER CREEK-FELTON, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Santa Cruz County, July, 1973. 24 p, 12 fig, 18 plates, 6 tab.

Descriptors: *Flooding, *Flood profiles, *Flood data, *Historic floods, *Flood stages, *Flood forecasting, Flood flow, Storms, Flood frequency, Peak discharge, Flood peak, Flow characteristics, Bank erosion, Control structures, Levee, Channel improvement, California.
Identifiers: Santa Cruz County(Calif), Santa Cruz(Calif), *San Lorenzo River(Calif), Boulder Creek(Calif), Bear Creek(Calif), Branciforte Creek(Calif), Standard Project Flood, Intermediate Regional Flood.

The portion of San Lorenzo River Basin covered by this report drains an area of 137 square miles located in central Santa Cruz County. Boulder Creek and Bear Creek join the river near the town of Boulder Creek. The terrain is nearly all mountainous and development is chiefly residential, resorts, and service industries. Bridges, culverts and brush can obstruct flood flows. Flooding has the greatest probability of occuring from November to April. In 1959, the Corps of Engineers completed a flood control project on the lower 2.5 miles of San Lorenzo River and on the lower 1.2 miles of its tributary, Branciforte Creek. Three damaging floods have occurred since 1940 with the worst in December, 1955. Peak discharge on the San Lorenzo reached 30,400 cubic feet per second, 388 acres were flooded, 7 lives lost, 2,830 persons displaced and damages estimated at more than $8,700,900. An Intermediate Regional Flood on the San Lorenzo at Redwoods State Park would reach a peak discharge of 40,000 cfs and would have channel velocities of 8-12 ft/sec. A Standard Project Flood would have a peak discharge of 49,000 cfs at the same location with slightly higher velocities. Overbank flows would average 2-4 ft/sec. (Henley-North Carolina)
W76-01373

FLOOD PLAIN INFORMATION: APTOS, TROUT AND VALENCIA CREEKS, CITY OF APTOS, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Santa Cruz County, California, July, 1973. 17 p, 9 fig, 8 plates, 6 tab.

Descriptors: *Floods, *Flooding, *Streamflow forecasting, *Flood profiles, *Flood damage, *Flood plains, Flood flow, Flood data, Peak discharge, Flood peak, Obstruction to flow, *California.
Identifiers: Aptos Creek(Calif), Valencia Creek(Calif), Aptos(Calif), Trout Creek(Calif), Bridge Creek(Calif), Santa Cruz County(Calif), Standard Project Flood, Intermediate Regional Flood.

The properties on the flood plain along Aptos Creek are urban and agricultural. The small Aptos Creek basin is about 24 square miles in area, extending 7 miles into the Santa Cruz Mountains. Aptos Creek and its prinicipal tributary, Valencia Creek, join together at the Town of Aptos (population 8,704, 1970 census) and drain into Monterey Bay, part of the Pacific Ocean. The streambed slopes from about 8 feet/mile in the lower reaches to about 300 feet/mile in the upper reaches of the study area. The largest recorded flood occurred in 1963. It reached a peak discharge, as recorded by the streamflow gage installed in 1959, of 2110 cubic feet per second and an elevation of 20.82 feet above mean sea level datum. The bulk of flooding on Aptos Creek has occured from December to March. Floodflow stages can rise to flood peaks in a relatively short period of time with high velocity in the main channels. It is estimated that an Intermediate Regional Flood would have a discharge of 3450 cfs and reach an elevation of 24.3 feet and that a Standard Project Flood would have a discharge of 4400 cfs and an elevation of 25.0 feet. Most of the 8 bridges and culverts in the area would be obstructive to the Intermediate Regional Flood. No flood control works have been constructed on Aptos Creek and there are no zoning ordinances or building codes in effect to prevent flood damage. (Smith-North Carolina)
W76-01374

WATER AS A TOOL IN LAND USE CONTROL, LEGAL CONSIDERATIONS: AN EXPLORATORY ESSAY,
White and Burke, Fort Collins, Colo.
For primary bibliographic entry see Field 6E.
W76-01393

REGULATION OF GREAT LAKES WATER LEVELS, A SUMMARY REPORT, 1974.
International Joint Commission-United States and Canada. Great Lakes Levels Board.
37 p, 40 photo, 6 tab, 7 charts, 1 map.

Descriptors: *Great Lakes, *Surface waters, *Water levels, *Water level fluctuations, High water marks, Low water marks, Elevation, Fluctuation, Lakes, Low flow, Hydraulic gradient, United States, Canada, Governments, Regulation, Water law, Water resources development.
Identifiers: International agreements, Water level studies, Water level control.

The Great Lakes are an international resource and an international responsibility. In 1964, because of the prevailing extreme low lake levels and the highs of 1952, the governments of Canada and the United States initiated a joint study of the water levels in the lakes. An International Joint Commission was established pursuant to Article IX of the Boundary Waters Treaty of 1909. Its purpose was to determine whether action would be practicable and in the public interest. Its function was to improve domestic water supplies, sanitation, navigation, water for power and industry, flood control, agriculture, fish and wildlife, and recreation. The International Great Lakes Levels Board was given the task of investigating factors which affect water levels in the Great Lakes. The Board was then to develop ways of controlling water levels, to estimate the costs of activating projects, and to assess the probable effects of the resulting hydrological, economical, environmental, and aesthetic changes. (Proctor-Florida)
W76-01395

SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 8D.
W76-01409

ZUMBRO RIVER BASIN, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 8A.
W76-01411

BAYOU BODCAU AND TRIBUTARIES, ARKANSAS AND LOUISIANA ASSOCIATED

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WATER FEATURES, RED RIVER, BAYOU BODCAU, FLAT RIVER, RED ETC....(FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8A.
W76-01412

SAINT FRANCIS BASIN PROJECT, ARKANSAS AND MISSOURI, (ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 8A.
W76-01414

HYDROGRAPH SYNTHESIS USING MATHEMATICAL MODELS,
Wollongong Univ. Coll. (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-01418

PROBLEMS IN THE PROGRAMMED OPTIMISATION OF A HYDROLOGICAL CATCHMENT MODEL,
Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 2A.
W76-01420

TRADEOFFS BETWEEN IRRIGATION SYSTEMS WITH DIFFERENT RELIABILITIES OF SUPPLY,
New South Wales Univ., Kensington (Australia). School of Economics.
For primary bibliographic entry see Field 3F.
W76-01424

FLOOD FREQUENCY DISTRIBUTION IN A CATCHMENT SUBJECT TO TWO RAINFALL PRODUCING MECHANISMS,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch.
For primary bibliographic entry see Field 2A.
W76-01425

FLOOD WATER ANALYSIS IN THE AREA OF THE TIDAL RIVER EIDER (HOCHWASSERANALYSE IM RAUM DER BINNENEIDER),
For primary bibliographic entry see Field 2E.
W76-01428

PREDICTION OF THE EFFECTS OF THE FLOODWATER OF THE OLONA RIVER IN TICINO (PREVISIONI SUGLI EFFETTI DELLA IMMISSIONS DELLE ACQUE DI PIENE DELL' OLONA IN TICINO),
R. Marchetti, A. Provini, and G. Zambon.
Inquinamento, Vol 17, No 6, p 19-33, June, 1975. 14 fig, 13 tab

Descriptors: *Flood control, *Canal construction, Rivers, Water analysis, Flood forecasting, Model studies, Statistical analysis, Overflow.
Identifiers: *Olona River(Italy).

A canal is being built for flood control purposes between the Olona River at the village of Rho and the Ticino at Mt. Abbiategrasso (near Milan, Italy), traversing a distance of 24 kilometers, and will handle overflow loads in the Olona exceeding 10 cu m per second. As a consequence of a potential for pollution of the Ticino from pollution problems in the Olona, a study was made to determine what effect this would have on the Ticino water, utilizing samplings of the Olona made between 1970 and 1972 at Rho. Using analyses of 77 water samples taken at various times of the year, which included determinations of mineral and organic particulate, material capable and incapable of sedimentation, oxygen content, BOD, COD, metals, ammonia, pH, anionic detergents, toxicity, eutrophicating compounds, and phosphorus and nitrogen compounds, statistical studies were made. These predict what effects the Olona flood waters would have on the Ticino when the overflow channel is in operation. It was concluded that a negligible amount of self-purification would take place as the Olona water traverses the 24 km length of the canal. (Morrow-FIRL)
W76-01447

LONG- AND SHORT-TERM FORECASTING OF RIVER DISCHARGE, (IN JAPANESE),
M. Hino, nd K. Ishikawa.
Domiku Gakkai Ronbun Hokokushu, Proceeding of the Japan Society of Civil Engineers, No 236, p 59-70, April, 1975. 15 fig, 4 tab, 9 ref

Descriptors: *Forecasting, *Rivers, Inflow, Data collection, Flow rate, Flood forecasting, Floods, Rain, Precipitation(Atmospheric), Mathematical studies, Hydrological aspects.
Identifiers: River discharge, Factor analysis, Japan, Typhoon.

Analysis of river discharge variation was carried out for the Sagami River, Japan, by canonical factor analysis. Prediction of long-term river discharge was performed by a reconstruction of several factors. Inflow data at Sagami Dam obtained from 1953 to 1970 showed a constant flow rate of approximately 30 cu m/sec from January to April, and great variation for the periods from the end of june to the beginning of July, mid-August to the end of August, and from mid-September to the end of that month. Drought had a periodicity of three years while severe drought had a periodicity of six years. Flood occurred from the end of June to the beginning of July due to concentrated rain; from mid-August to the end of August due to summer typhoon; and from the end of September to the beginning of October due to fall typhoon. The factors considered included basic analysis independent of the effects of rain and typhoon, seasonal variations, and rain and typhoon factors. (Su-FIRL)
W76-01454

CALIFORNIA HIGH WATER, 1973-1974,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 2E.
W76-01482

STILLWATER RIVER AND ROSEBUD CREEK FLOOD HAZARD ANALYSES, STILLWATER COUNTY, MONTANA.
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 2E.
W76-01483

BIOLOGICAL CONTROL OF ALLIGATOR WEED,
Office of the Chief of Engineers (Army), Washington, D.C. Aquatic Plant Control Program.
E. O. Gangstad, R. A. Scott, Jr., and R. G. Cason.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-759 500, $6.75 in paper copy, $2.25 in microfiche. Technical Report 3, April 1973. 167 p, 7 ref, 4 append.

Descriptors: *Alligatorweed, *Aquatic weed control, *Aquatic insects, *Biocontrol, *Florida, Weed control, Weeds, Aquatic weeds, Aquatic plants, Aquatic life, Floating plants, Biological treatment, Biological communities, Biology, Insects, Southeast U.S., Rivers, Herbicides.

The Agasicles flea beetle is a major contributor to the role that biotic agents play in regulating alligator weed in its native home, and now in certain areas of the United States. The greatest success with the Agasicles as a biocontrol for alligator weed has been at experimental sites in Florida. The increased effectiveness of the alligator weed beetle in this area is believed to be related to the ability of the insect to overwinter. The Agasicles population usually has two peaks of activity in Florida as compared with one in other states. Alligator weed mats present at the beginning of the study reported herein have decreased in size and thickness. Plant competition has played an important role in controlling the alligator weed at the Goose Creek site by Agasicles and at several other sites in the southeastern states. The feeding of the Agasicles on alligator weed decreases its ability to compete with other aquatic plants. Other insects may be used to extend control over a greater geographic area. This report summarized research studies on the aquatic problem plant alligator weed, exploration for its natural enemies, introduction and distribution of insect enemies, and the evaluation of biological control effects. Details of these studies were contained in appendixes. (Sims-ISWS)
W76-01495

4B. Groundwater Management

STEADY INFILTRATION FROM LINE SOURCES BURIED IN SOIL,
Department of Agriculture, Watkinsville.
For primary bibliographic entry see Field 3F.
W76-01065

ANHYDROUS AMMONIA APPLICATION IN IRRIGATION WATER VS. MECHANICAL AND ITS EFFECT ON CORN YIELDS,
Nebraska Univ., Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-01072

ALTERNATE-FURROW IRRIGATION OF FINE TEXTURED SOILS,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-01073

SOIL SALINITY DISTRIBUTION IN SPRINKLER AND SUBSURFACE-IRRIGATED CITRUS,
Brigham Young Univ., Provo, Utah.
S. D. Nelson, and S. Davis.
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 1, p 140-143, January-February 1974. 4 fig, 3 tab, 4 ref.

Descriptors: *Saline soil, *Salinity, *Sprinkler irrigation, *Subsurface irrigation, *Citrus fruits, Leaching, Irrigation practices, Irrigation effects, Irrigation systems, Irrigation, Agriculture, Irrigation efficiency, Soil-water-plant relationships, Soil salinity.
Identifiers: *Trickle irrigation, *Drip irrigation.

Soil salinity distribution produced by subsurface irrigation results in maximum salt concentrations at the perimeter of the wetting front. The soil salinity increases most in the soil above the burial depth of the subsurface pipe. Winter rainfall could be effectively used to leach accumulated surface salts from the root zone of subsurface--irrigated citrus in southern California, by maintaining a high water content during the rainfall months, allowing precipitation to be used only for leaching and not for increasing the soil water content. By using this management method, a more favorable salt balance was maintained. (Skogerboe-Colorado State)
W76-01074

CONTROLLING CENTER PIVOT SPRINKLERS FOR EXPERIMENTAL WATER APPLICATION,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 7B.
W76-01080

FIELD LEACHING BY SPRINKLER AND SURFACE IRRIGATION DURING A CROP SEASON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. F. Hermsmeier, and M. T. Kaddah.
Transactions of the ASAE American Society of Agricultural Engineers, Vol 17, No 2, p 275-279, March-April 1974. 4 fig, 5 tab, 1 ref.

Descriptors: *Leaching, Sprinkler irrigation, Surface irrigation, Salinity, Irrigation practices, Irrigation effects, Irrigation operation and management, Irrigation water, Barley, Crop production, Irrigation, Agriculture, Saline soils.

Applying excess irrigation water to a winter barley crop can be used to leach salt from the soil at the same time crop production is proceeding. Surface irrigation and sprinkler irrigation were equally effective in leaching salt from the soil during a barley season. Application of more water between the drains than near the drains with sprinklers improved but slightly the salt removal between the drains in the top foot of soil and gave no greater improvement at a depth of 4 to 5 feet. Application of 30% excess water with surface irrigation and 67% excess water with sprinklers produced good barley yields. (Skogerboe-Colorado State)
W76-01081

IRRIGATION TIMING BY THE STRESS DAY INDEX METHOD,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-01082

OPTIMIZATION OF WATER USE EFFICIENCY UNDER HIGH FREQUENCY IRRIGATION: II SYSTEM SIMULATION AND DYNAMIC PROGRAMMING,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-01083

HYDROGEOLOGY ALONG THE PROPOSED BARRIER-RECHARGE-WELL ALINEMENT IN SOUTHERN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N. Y.
H. F. H. Ku, J. Vecchioli, and L. A. Cerrillo.
For sale by USGS, Reston, Va 22092, Price $1.00. Hydrologic Investigations Atlas HA-502, 1975. 1 sheet, 18 ref.

Descriptors: *Hydrogeology, *Groundwater movement, *Saline water barriers, *Injection wells, *New York, Hydrologic data, Water pollution control, Aquifer characteristics, Maps, Petrology, Subsurface investigations.
Identifiers: *Nassau County(NY), Magothy aquifer.

In Nassau County all fresh-water supplies are derived from groundwater sources, of which the Magothy is the principal aquifer. The suitability of the hydrogeologic environment of the Magothy Aquifer is evaluated for development of a hydraulic barrier to retard or halt salt-water intrusion into the aquifer. The barrier would consist of a line of wells through which reclaimed water (highly treated sewage-plant effluent) would be injected into the Magothy Aquifer. A summary of the hydrogeology of the Magothy Aquifer and overlying and underlying units in southern Nassau County is tabulated and pertinent data are shown on a hydrogeologic map. The proposed location of the recharge barrier, about 1 mile south of Sunrise Highway, seems reasonable in that it: (1) is south of any public-supply wells that tap the Magothy Aquifer and (2) is within that part of the Magothy Aquifer confined by overlying Pleistocene clay units. The confinement provided by the overlying Pleistone clay units would greatly inhibit vertical dissipation of the recharge head beyond the top of the Magothy and would lead to maximum effectiveness of the hydraulic barrier. (Woodard-USGS)
W76-01184

LAND SUBSIDENCE DUE TO GROUNDWATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA: PART 1.CHANGES IN THE HYDROLOGIC ENVIRONMENT CONDUCTIVE TO SUBSIDENCE,
Geological Survey, Reston, Va.
W. B. Bull, and R. E. Miller.
Supt. of Documents, GPO, Wash., D. C. 20402 Price $2.05. Professional Paper 437-E, 1975. 71 p, 47 fig, 3 tab, 28 ref.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, *Hydrogeology, *California, Geology, Aquifer characteristics, Hydrologic data, Pumping, Water wells, Water yield, Water levels, Geomorphplogy, Groundwater movement, Groundwater recharge, Water demand.
Identifiers: *Los Banos-Kettleman City Area(Calif).

About 500 to 2,000 feet of unconsolidated flood plain, alluvial-fan, lacustrine, deltaic, and marine deposits are compacting at accelerated rates because of man's changes in the hydrologic environment in the west-central San Joaquin Valley, Calif. Groundwater pumping has increased the stresses tending to compact the deposits by as much as 50 percent. Three basic hydrologic units comprise the groundwater reservoir between Los Banos and Kettleman City. An upper-zone aquifer system, 100-900 feet thick, extends from the land surface to the top of the second unit. It is a lacustrine confining clay. The upper zone consists mainly of poorly permeable alluvial-fan deposits derived from the Diablo Range that contain semiconfined water of poor quality. The lacustrine aquiclude, the Corcoran Clay Member of the Tulare Formation, extends beneath the entire study area except for the southwestern part adjacent to the Diablo Range. The third hydrologic unit, the confined aquifer system of the lower zone, supplies about three-fourths of the groundwater pumped and is the zone in which 50-95 percent of the compaction causing the subsidence occurs. The lower zone consists mainly of flood deposits in the northern part, alluvial-fan deposits in the southern part, and diverse continental to marine deposits in the central part of the area. (Woodard-USGS)
W76-01192

UNDERGROUND STORAGE OF TREATED WATER: A FIELD TEST,
For primary bibliographic entry see Field 2F.
W76-01253

WATER RESOURCES OF VOLCANIC ISLANDS, A PILOT PROJECT IN THE CANARIES,
For primary bibliographic entry see Field 2A.
W76-01258

HYDROGEOLOGY OF A PORTION OF THE SAND HILLS AND OGALLALA AQUIFER, SOUTH DAKOTA AND NEBRASKA,
South Dakota School of Mines and Technology, Rapid City.
For primary bibliographic entry see Field 2F.
W76-01299

STEP-DRAWDOWN TEST ANALYSIS BY COMPUTER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. W. Labadie, and OJ J. Helweg.
Ground Water, Vol 13, No 5, p 438-444, September-October 1975. 5 fig, 3 tab, 17 ref.

Descriptors: *Groundwater, *Turbulent flow, *Water wells, *Optimization, *Computer programs, Aquifer characteristics, Aquifer testing, Turbulence, Drawdown, Well data, Transition flow, Testing, Anlytical techniques, Least squares method, Discharge(Water), Pumping.
Identifiers: Step-drawdown test, Step test, Well loss, Well efficiency, Effective well radius, Pump test.

Many geohydrologists believe that the step-drawdown test is useful in determining many important characteristics of a well, whereas others altogether question its utility. In addition to this controversy, its application is hindered because the graphical analysis of data is unwieldy. A computer was presented for step-drawdown test analysis which is efficient and simple to use; moreover, it was an example of how optimization could be used in a practical way. A listing of the FORTRAN code was included along with some example calculations. The computer program generates least-squares fitting to step-test data to produce values of B, C, and P of the drawdown equation BQ plus CQ to the Pth power. (Prickett-ISWS)
W76-01300

WATER 'MINING' DECLARED UNLAWFUL UNDER IDAHO GROUND WATER STATUTE.
For primary bibliographic entry see Field 6E.
W76-01396

THE QUALITY AND TREATMENT OF ARTESIAN WATERS IN HUNGARY (A HAZAI MELYSEGI VIZEK KEZELESENEK SZUKSEGESSEGE ES TECHNOLOGIAJA),
For primary bibliographic entry see Field 5F.
W76-01453

4C. Effects On Water Of Man's Non-Water Activities

QUANTITATIVE TECHNIQUES FOR EVALUATING THE ENVIRONMENTAL IMPACT OF TRANSPORTATION SYSTEMS,
Sydney Area Transportation Study (Australia).
T. R. Mongan, R. S. Nielsen, and N. J. Nielsen.
Royal Australian Planning Institute Journal, Vol 11, No 4, p 135-142, October 1973. 9 ref.

Descriptors: *Transportation, *Environment, *Evaluation, Water pollution, Solid wastes, Air pollution, Social aspects, Pollutants, Estimating.
Identifiers: *Environmental impact, *Quantitative techniques, Social disruption, Noise pollution, Urban areas.

The size and cost of transportation systems have grown so large and the time periods needed to amortize the investment have become so long that the detrimental effects of these systems on the urban environment are likely to be particularly long-lived. In evaluating a transportation system, it is necessary to weigh the detrimental environmental impact of the system against the convenience and economic stimulation which the system is expected to produce. Most detrimental environmental impacts of transportation systems can be classed as pollution or social disruption. Presented are some methods for preparing quantitative estimates of these two classes of environmental impacts which have been developed for the Sydney Area Transportation Study and appear to be generally applicable. In developing these esti-

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mates, two basic questions are posed: (1) What are the actual physical effects of a given system on the environment; and (2) What are the levels at which these effects are undersirable or harmful. The first question, which is a scientific and technical one requiring the assistance of technical specialists to answer it is discussed. (The second question is one of values.) Some of the main emission sources leading to high pollutant concentration in large urban areas are transport related. The emissions from transportation system components can cause air, noise, solid waste, and water pollution; each of these problems is considered at it relates to transport technology. Road, rail, air, and water-borne transport are discussed. (Bell-Cornell)
W76-01009

CONCEPTUAL MODEL DESIGN FOR MOTORWAY STORMWATER DRAINAGE,
For primary bibliographic entry see Field 2A.
W76-01062

COMPUTER PROGRAM FOR DRAINAGE QUANTITIES,
T. Williams.
Surveyor, Vol 141, No 4207, p 38-41, January 26, 1973. 7 fig.

Descriptors: *Model studies, *Computer programs, *Sewers, *Drains, Storm drains.

The majority of road contracts prepared in the United Kingdom conform to the model contract document for highway works contracts of the Department of the Environment. The standardized way in which drainage information has to be presented is particularly suited to the use of a computer which also reduces repetitive error-prone manual operations. A suite of programs has therefore been written which include KIDD2, BILL, MHOLE, and MHBILL. KIDD2 produces printed output in the form of sewer schedules and gutter schedules, together with punch cards for use as input to BILL. BILL takes as input cards produced from one or more runs of KIDD2 plus any punched manually, and gives a print-out in the form of bill of quantity items. MHOLE uses the same basic card input as KIDD2, yielding printed output in the form of a manhole schedule sorted according to type, together with punched cards for MHBILL. MHBILL accepts cards produced from one or more runs of MHOLE plus any punched manually, and provides print-out in the form of bill of quantity items. The KIDD2 program does the working-up required for sewers and gutter connections. It handles any number of these in the same run by the use of separate subroutines, control being transferred to the appropriate subroutine or returned to the main program by signal cards. The BILL program combines the manual operations of abstracting and billing. It also calculates the average depth and selects the maximum depth for each item. At the same time, it counts the numbers of each kind of gutter connection, and the numbers of junctions of these connections with storm sewers of each size. The purpose of the MHOLE program is to identify each sewer terminal and to calculate and record its name, type, and its depth and volume. The MHBILL program replaces the manual tasks of abstracting and billing, its main function being that of sorting. It uses as input 44-cards output from one or more runs of MHOLE together with any punched manually. (Sandoski-FIRL)
W76-01285

URBANIZATION IMPACT ON WATER QUALITY DURING A FLOOD IN SMALL WATERSHEDS,
Wisconsin Univ., Milwaukee, Dept. of Geological Sciences.
D. S. Cherkauer.
Water Resources Bulletin, Vol 11, No 5, p 987-998, October 1975. 6 fig, 4 tab, 19 ref.

Descriptors: *Urban runoff, *Water quality, *Streamflow, *Rural areas, *Wisconsin, Peak discharge, Land use, Floods, Suspended solids, Sodium, Chlorides, Calcium, Magnesium, Bicarbonates, Urbanization, Hydrology.
Identifiers: Brown Deer Creek(Wis), Trinity Creek(Wis), Milwaukee(Wis).

The impact of various urban land uses on water flow and quality in streams is being studied by monitoring small streams in the Milwaukee urban area. The responses of an urban watershed and an agricultural watershed to an autumn rainfall of 2.2 cm were compared. Flow from the urban basin showed a substantially greater response to the rain than that from the rural. Dilution, resulting from the greater quantities of surface runoff in the urban watershed, caused lower concentrations of sodiut. , chloride, calcium, magnesium, bicarbonate, and total dissolved solids in the urban stream. The total quantity of these materials removed per unit drainage area of the urban basin was much greater, however. Road salt was still among the dominant dissolved materials in the urban water chemistry seven months after the last road salting. Sodium was apparently being released from adsorption by clays in the urban basin. Suspended sediment concentrations and total loads were higher in the urban stream. (Lardner-ISWS)
W76-01307

THE ROLE OF THE ACADEMIC IN WATER RESOURCES POLICY-MAKING: THE TIJUANA RIVER, A CASE STUDY,
California State Univ., San Diego.
For primary bibliographic entry see Field 6B.
W76-01359

PRIVATELY-OWNED WATER SUPPLY SYSTEMS,
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa.
For primary bibliographic entry see Field 3D.
W76-01366

4D. Watershed Protection

NO-TILLAGE SYSTEM REDUCES EROSION FROM CONTINUOUS CORN WATERSHEDS,
Agricultural Research Service, Coshocton, Ohio.
For primary bibliographic entry see Field 2J.
W76-01078

HYDROLOGY OF BLACK MESA WATERSHEDS, WESTERN COLORADO,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
E. C. Frank, H. E. Brown, and J. R. Thompson.
USDA Forest Service, General Technical Report RM-13, June, 1975. 11 p, 8 fig, 6 ref, 4 tab.

Descriptors: *Hydrology, *Watersheds(Basins), *Surface runoff, *Suspended load, Sediments, Water pollution sources, Colorado, Runoff, Sediment yield, Storm runoff, Soil erosion, Precipitation(Atmospheric), Streamflow, Grazing, Water supply, Water quality, Grasslands.
Identifiers: Black Mesa(Colorado).

For 11 years, precipitation, streamflow, and sediment were measured from three small watersheds on Black Mesa in the mountain grasslands of western Colorado to obtain information about hydrologic processes. Runoff and suspended sediment data show no relationship to bare soil intercept. This lack of relationship is probably due to the experimental error in measuring these small amounts of sediment. Bare intercept decreased on each watershed during the 1957-1967 period, even though grazing utilized an average of 40% of the grass in the open parks on one of the watersheds. While suspended-sediment concentration after summer storms can be as much as 6 times tha sampled during snowmelt, total yield averages 9 lb/acre from spring runoff and 11 lb/acre from storm runoff because of the small volume of flow Based on current erosion classification schemes these are very minor amounts of geologic erosion (Witt-IPC)
W76-01233

DETERMINATION OF URBAN WATERSHED RESPONSE TIME,
Colorado State Univ., Fort Collins.
E. F. Schulz, and O. G. Lopez.
No 71, Hydrology Papers, Colorado State University, Fort Collins, Colorado, December 1974. 41 p 8 fig, 12 tab, 96 equ, 74 ref, 2 append.

Descriptors: *Urban hydrology, *Watersheds(Basins), *Floods, *Unit hydrographs, Storms, Rainfall, Runoff, Networks, Data processing, Correlation analysis, Drainage, Equations, Systems analysis, Planning, Colorado.
Identifiers: Stepwise multiple regression, Parameters of urbanization, Lag time, Response time, Denver(Colo), Linear regression.

Urban engineers are plagued by many problems related to hydrology. On e of these is flooding and the design of storm water drainage. Accompanying the frequent flooding are the tendency of the water courses to deteriorate and problems of sedimentation. Reported is a study which has developed correlations between flood hydrograph parameters and physical features unique to the urban watershed. After a review of previous work and a discussion of different methods for quantifying urbanization, a stepwise multiple regression technique was used to select the best parameter of urbanization. The rainfall and flood events from nine urban watersheds in the Denver Metropolitan region were analyzed. Unit hydrographs were derived from the measured floods on these watersheds, and the unit hydrograph parameters were correlated with storm and physical watershed parameters. It was found that the changes in the unit hydrograph in the urban region were related to the decrease in the watershed response time. The best way of defining the response time was the lag time. The lag time was found to be sensitive to the increase in the hydraulic capacity, to the decrease in the ratio of previous watershed, and to the shape of the watershed. (Bell-Cornell)
W76-01339

ENVIRONMENTAL RECONNAISSANCE TECHNIQUES FOR CONNECTICUT RIVER BASIN WATERSHEDS,
Center for the Environment and Man, Inc., Hartford, Conn.
D. R. Zoellner, and G. M. Northrop.
Available from the National Technical Information Service Springfield, Va 22161 as PB-238 497, $5.00 in paper copy, $2.25 in microfiche. Prepared for the Connecticut River Basin Program, New England River Basins Commission, Boston, Massachusetts. Final report No CEM 4155-498, March 1974. 96 p, 7 fig, 16 tab, 27 ref, append. CRSS-NERBC 1.6B.

Descriptors: *Watershed management, *River basins, Methodology, *Environmental effects, *Flood damage, Flood protection, Water quality, Flood plains, Erosion, Drainage patterns(Geologic), Soils, Sedimentation, *Connecticut River.
Identifiers: *Ecological profiles, *Environmental impacts, *Connecticut River Basin, Mill River(Mass), Black River(Vt), Northhampton(Mass), Springfield(Vt), Flood management alternatives.

Methods are delineated for performing in a short period of time an environmental reconnaissance of a Connecticut River Basin (CRB) watershed, which will result in enough information to assess

he impacts that would raise from various flood-damage reduction alternatives. From the study of he Mill River and Black River watersheds, some general rules are developed for such studies, and research needs are identified. For an adequate study of Connecticut River Basin watershed the following are necessary: (1) an environmental profile that establishes the natural and manmade characteristics, presents a framework for information and identifies information sources; (2) a matrix approach for arraying flood management alternatives against watershed characteristics. Some of the more salient features that determine he present environmental characteristics of streams are: area, topography, climatology, soil conditions, vegetation and urban-rural development; location function and condition of existing man-made impoundments; man-oriented past and present stream uses with emphasis on pollutants; present status of diversity and productivity of stream life. The matrix approach for flood management alternatives lists alternative functional activities vertically on the matrix and natural environment characteristic horizontally. The latter consists of Sectors which is a physical category, Elements which are physical subdivisions of the natural sectors, Characteristics of the Elements, and Functional Activities which is the behavior of the entities in carrying out their natural functions. The report lists envrionmental impacts associated with reservoir projects and flood damage reduction projects. (Smith-North Carolina)
W76-01344

SEDIMENT ROUTING FOR AGRICULTURAL WATERSHEDS,
Agricultural Research Service, Temple, Tex.
J. R. Williams.
Water Resources Bulletin, Vol 11, No 5, p 965-974, October 1975, 6 tab, 16 ref.

Descriptors: *Sediment yield, *Agricultural watersheds, *Soil erosion, *Settling velocity, *Texas, Sheet erosion, Rill erosion, Gully erosion.
Identifiers: *Universal soil loss equation, Sediment routing.

A sediment routing technique was developed to route sediment yield from small agricultural watersheds (less than or equal to 10 sq mi) through streams and valleys to the outlet of large watersheds (less than or equal to 1000 sq mi). The procedure was based on the modified universal soil loss equation and a first order decay function of travel time and particle size. Deposition was dependent upon settling velocities of the sediment particles, travel time, and the amount of sediment in suspension. Sediment routing increases sediment yield prediction accuracy and allows determination of subwatershed contributions to the total sediment yield. Also the locations and amounts of floodplain scour and deposition can be predicted. Another advantage of sediment routing is that measured sediment yield data are not required. The procedure performed satisfactorily in test routings on two Texas blackland watersheds. More tests were planned with data from other physiographic areas. (Bhowmik-ISWS)
W76-01471

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A CHARACTERIZATION OF THE EFFLUENT FROM COMMERCIAL CATFISH PONDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
D. B. Beasley, and J. B. Allen.
Presented at 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974; Paper No. 74-5004, 28 p. 16 fig, 5 tab, 9 ref.

Descriptors: *Effluents, *Fish farming, *Farm wastes, Water sampling, Ponds, Biochemical oxygen demand, Nutrients, *Chemical analysis, Catfishes, Fish stocking.
Identifiers: *Commercial catfish ponds, Total solids.

This investigation was carried out to obtain a meaningful chemical and biochemical characterization of the effluent from commercial catfish ponds. The water samples were taken from commercial catfish ponds in both the Mississippi and Arkansas Delta areas. The ponds ranged in size from 10 to 40 acres and the stocking rates included 1800, 2000, and 3000 fish per acre. All of the ponds were sampled on the surface, and one pond at each stocking rate was also sampled at the bottom. This data was arranged in order to compare both the differences in stocking rates and the difference in sampling depths. The water quality in the ponds monitored usually met or exceeded standards set forth for recreational waters by the Mississippi Air and Water Pollution Control Commission. In a majority of cases, the values of most of the parameters obtained from samples taken from the bottom of these ponds was slightly higher than corresponding values obtained from samples taken at the surface. Also, the ponds stocked at higher rates usually had slightly higher values of BOD, nutrients, and total solids. (Cartmell-East Central Oklahoma State)
W76-01041

METAL ANALYSIS BY MODEL 630-C HITACHI LIQUID CHROMATOGRAPH (630-C-GATA HITACHI EKITAI KUROMATOGRAPHU NI YORU KINZOKU BUNSEKI),
T. Hamano, and Y. Takata.
Hitachi Hyoron, Vol 55, No 2, p 21-25, February, 1973. 10 fig, 3 ref.

Descriptors: *Analytical techniques, *Heavy metals, Pollutant identification, Saline water, Industrial wastes, Potable water, Industrial water, Boiler feed water, Hardness(Water).
Identifiers: Japan, Liquid chromatography, Electrolytic cells, River water.

The Hitachi Company of Japan has developed a new liquid chromatograph, Model 630-C, using stable electric potential coulometry for analysis of heavy metals. In using this apparatus, when the reaction reaches a given point electrolysis of these metals is completed and analysis is quick. Also, selective reactions are possible using electrolytic potential differences, high sensitivity can be expected, an absolute determination of quantity is possible, calibration curves are not necessary, and the results are not affected by the temperature or the consistency of the liquid. The structure of the apparatus is such that the column solution passes through the electrolytic cell, and the elements in the solution complete electrochemical reaction while passing the cell. If the flow speed is stable, the electric current will show the concentration of the material in the solution. By changing the resin packing of the separation column and the column temperature, the position of analysis may be changed in order to avoid overlapping and 5 to 6 elements can be analyzed in 30 to 40 minutes. This method is applicable to heavy metal ions in saline water or river water, for analysis of liquid waste from industries, and hardness analysis of drinking, industrial, or broiler water. (Sandoski-FIRL)
W76-01060

EVIDENCE FOR THE OCCURRENCE OF SPECIFIC IRON (III)-BINDING COMPOUNDS IN NEAR-SHORE MARINE ECOSYSTEMS,
Texas Univ., Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W76-01101

ANODIC STRIPPING VOLTAMMETRY WITH THE FLORENCE MERCURY FILM ELECTRODE DETERMINATION OF COPPER, LEAD AND CADMIUM IN SEA WATER,
Oslo Univ. (Norway). Dept. of Chemistry.
W. Lund, and M. Salberg.
Analytica Chimica Acta, Vol 76, No 1, p 131-141, May, 1975, 5 tab, 5 fig, 17 ref.

Descriptors: *Analytical techniques, *Heavy metals, *Sea water, *Trace elements, Volumetric analysis, Model studies, Electrodes, *Copper, Lead, Cadmium, Mercury.
Identifiers: *Voltammetric technique, *Ligands, Complexes.

The determination of trace metals in sea water is an important application of stripping voltammetric technique. Cu, Pb, and Cd were chosen to analyze in a model system for the critical evaluation of the technique. The analyses were carried out at a pH of 8 in the absence of added chemicals, using the rotating glossy carbon electrode mercury plated in situ for anodic stripping voltammetry. The choice of electrode material, effect of instrumental parameters on the stripping response, and sensitivity of the complex-forming ligands are discussed. The performance of the film electrode is compared to that of the hanging Hg drop electrode. (Delfiner-Vanderbilt)
W76-01105

ANALYSIS OF ARAGONITE FROM THE CUTTLEBONE OF SEPIA OFFICINALIS L.,
Hull Univ. (England). Dept. of Geology.
R. A. Hewitt.
Marine Geology, Volume 18, No 2, p M1-M5, February, 1975, 3 fig, 10 ref.

Descriptors: *Heavy metals, *Spectrometers, *Marine animals, *Marine biology, Spectrophotometry, Analytical techniques, *Strontium.
Identifiers: *Septa, *Intracameral walls, *Cuttlebones, *Atomic-absorption flame spectroscopy, *Aragonite.

Samples of the septa and intracameral walls of cuttlebones from the English Channel was isolated from each other, using a described technique. Rapid analyses of the Sr and Mg content of successive growth increments were performed by atomic-adsorption flame spectroscopy. The results showed that during the winter Sr content is approximately double that of the summer, but similar high values can also occur in summer due to calcium deficiency. (Kemp-Vanderbilt)
W76-01108

A NOTE ON THE EFFECT OF CHEMICAL TREATMENTS IN THE MINERALOGICAL STUDIES OF SEDIMENTS,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
V. Subramanian.
Experientia, Vol 31, No 1, p 12-13, January 15, 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Heavy metals, *Iron, *Mineralogy, *Sediments, *Radiation, Chemical reactions, Sodium compounds, Pollutant identification, Chemical properties, Clay minerals, Kaolinite, Illite, Montmorillonite, X-ray diffraction, Atlantic Ocean.
Identifiers: Mossbauer spectra, Velocity-absorption spectra, Metallic coatings, Amazon River.

Changes were observed brought about by chemical pretreatment in the Mossbauer spectra of natural sedimenta samples. X-ray and other analytical tools were used. Sediment samples are commonly treated with Nacitrate, Na-bicarbonate and Na-dithionite to remove metallic coatings, and with H_2O_2 to break up the organics. A sediment sample was collected from the Atlantic Ocean off the mouth of the Amazon River, which consisted of

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equal amounts of kaolinite, illite, and montmorillonite. Mossbauer effect was observed on both treated and untreated sediment. The data obtained were computer fitted to obtain the velocity-absorption (intensity) spectra. The data indicate that the chemical treatment affects the basic structure of the silicates, in addition to removing some, but not all of the iron in the coatings. It is most likely that the structural changes occur in the montmorillonite fraction. These results indicate that the usefulness of chemical pretreatment for mineralogical studies needs to be re-evaluated. (Davis-Vanderbilt)
W76-01109

MEASUREMENT OF ZOOPLANKTON BIOMASS BY CARBON ANALYSIS FOR APPLICATION IN SOUND SCATTERING MODELS,
Naval Postgraduate School, Monterey, Calif.
J. C. Radney.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-001 294, $5.50 in paper copy, $2.25 in microfiche. Master's thesis, September 1974, 122 p. 39 fig, 5 tab, 45 ref.

Descriptors: *Measurement, *Zooplankton, *Biomass, *Carbon, *Analytical techniques, Acoustics, Methodology, Sonar, Oceans.
Identifiers: LECO Carbon Analyzer, Benzoic acid, Casein, Tigriopus californicus, Monterey Bay(Calif), Sound scattering.

Organic carbon analysis is a simple, reliable test of marine organism (zooplankton) biomass. The LECO Carbon Analyzer which employs high temperature dry combustion and a thermal conducting sensor was adapted for determining total carbon. Analysis was rapid (70 seconds), consistent (plus or minus 3%) consistent (plus or minus 3%). Less than 71 mg of carbon in benzoic acid or casein could be measured. Biomass measurement using carbon analysis was tested by determining the carbon content in a marine copepod, Tigriopus californicus; the mean carbon content was 38.6% freeze-dried weight. The mean adenosine triphosphate-carbon to total carbon ratio in T. californicus was 0.2634%; this was used to determine living biomass of field net samples. Zooplankton were considered to be indigenous above 200 m and distributed in patches dependent on space and time. Estimates of total, living, and dead biomass by carbon analysis and ATP measurements showed definite seasonal trends in Monterey Bay, California. Standard curves of the LECO Carbon Analyzer should be verified with other standards. Collection and freeze-drying techniques need to be improved. Diurnal and multi-day studies are suggested. Acoustic measurements should be made in the same region to test the application of zooplankton biomass measurements to sound scattering. (Buchanan-Davidson--Wisconsin)
W76-01163

BASICS OF POLLUTION CONTROL.
Gurnham and Associates, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-01228

BACTERIAL FLORA OF SALINE AQUIFERS,
North Carolina State Univ., Raleigh. Dept. of Microbiology.
C. J. Willis, G. H. Elkan, E. Horvath, and K. R. Dail.
Ground Water, Vol 13, No 5, p 406-409, September-October 1975. 1 tab, 10 ref. NSF GI-39586 (RANN).

Descriptors: *Bacteria, *Methane bacteria, *Analytical techniques, *Aquifers, *Microorganisms, *Saline water, Chromatography, Sulfur bacteria, Anaerobic bacteria, Aerobic bacteria, Pollutant identification, Chemistry, Instrumentation, Methane, Analysis, On-site investigations, Florida, Surface waters, North Carolina, Soils, Pollutants, Observation wells, Sampling, Water pollution, Industrial wastes, Artesian aquifers, Injection wells, Waste disposal, Liquid wastes.
Identifiers: *Bacterial flora, *Saline aquifers, *Methanogenic bacteria, *Waste injection wells, Microbial populations, Facultative microorganisms, Subsurface storage, Subsurface ecosystems, Biological activity, Desulfovibrio, Flavobacterium.

The bacterial flora of three unpolluted saline aquifers were examined. Aerobic, anaerobic, and facultative microorganisms were isolated and classified to genus. The organisms isolated were those commonly found in surface water and soil. Methanogenic bacteria were present in all aquifers. (Henley-ISWS)
W76-01254

WATER RESOURCES ASPECTS OF THE PROPOSED PERKINS STATION NUCLEAR POWER PLANT.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Water Resources Planning Dept.
For primary bibliographic entry see Field 8A.
W76-01274

A METHOD FOR THE DETERMINATION OF TOXICITY OF POLLUTANTS IN WATER AND EFFLUENT TO BACTERIA (EINE METHODE ZUR BESTIMMUNG DER BAKTERIENTOXIZITAET VON SCHADSTOFFEN IN WASSER UND ABWASSER),
R. H. W. Schubert.
Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankneiten und Hygiene, Abteilung 1: Originale B, Vol 156, No 6, p 545-550, 1973. 1 tab, 3 ref.

Descriptors: *Analytical techniques, *Toxicity, *Bacteria, Effluents, Water, Biochemical oxygen demand, Pollutants.
Identifiers: Mutations, Aeromonas hydrophila.

A spontaneous mutant of Aeromonas hydrophila, a species which is characteristic of the effluent-surface water biotype and is fairly sensitive to toxic substances, has been examined as a method for testing pollutant toxicity to bacterial organisms. In the investigation, mutant growth inhibition by the pollutant in BOD dilution water containing 10 to the minus 5th power percent vitamin-free hydrolyzed casein served as a measure of toxicity. A culture of the mutant in the treated BOD dilution water served as a control. Investigations of samples for toxicity are possible due to the specific properties of the mutant. (Sandoski-FIRL)
W76-01292

CHEMISTRY OF MUN-WATER INTERFACE IN AN IMPOUNDMENT,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 2K.
W76-01304

ADAMS COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 7C.
W76-01317

HENDERSON COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 7C.
W76-01318

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS, FEBRUARY 1973,
Canada Centre for Remote Sensing, Ottawa (Ontario) Data Acquisition Div.
J. N. de Villiers.
Available from the National Technical Information Service as PB-238 841, $3.50 in paper copy, $2.25 in microfiche. Data Report 73-7 (Formerly 73-16), September 1973. 18 p, 7 fig.

Descriptors: *Remote sensing, *Oil spills, *On-site investigations, *Pollutant identification, Aerial photography, Instrumentation, Photography, Water pollution sources, Oil, Infrared radiation, Measurement, Mapping, *Path of pollutants.
Identifiers: *Grand Bahamas, Naptha, Louisiana crude oil, Laser fluorosensor.

An airborne exercise employing various sensors to investigate their ability to detect and map Louisiana Crude and Naptha oil spills, both by day and by night, was described. It was shown that photographic, infra-red scanning and low light level T.V. all have some ability to detect Louisiana Crude; only infra-red scanning detected naptha. None of these sensors could identify the anomalies as oil. Sampling the anomaly from a boat or use of other sensing techniques (such as fluoro-sensing) was needed to identify the anomaly positively as oil. A laser fluorosensor showed promise in detecting oil at night. Further development will be needed to explore the full potential of such a technique. (Humphreys-ISWS)
W76-01324

A SURVEY FOR THE USE OF REMOTE SENSING IN THE CHEMICAL BAY REGION,
Maryland Univ., Solomons. Chesapeak Biological Lab.
For primary bibliographic entry see Field 5B.
W76-01327

METHODS AND DATA REQUIREMENTS FOR RIVER-QUALITY ASSESSMENT,
Geological Survey, Portland, Oreg.
D. A. Rickert, W. G. Hines, and S. W. McKenzie.
Water Resources Bulletin, Vol 11, No 5, p 1013-1039, October 1975. 5 fig, 1 tab, 32 ref.

Descriptors: *Water resources, *Planning, *Management, *River basins, *Water quality, Dissolved oxygen, Communication, Simulation analysis, Mathematical models, Mapping, Systems analysis, Decision making, *Oregon, Environmental effects.
Identifiers: *Environmental impact assessment, Data programs, *Willamette River basin(Oregon).

The U.S. Geological Survey is conducting an intensive river-quality assessment of the Willamette River basin, Oregon. The objectives are to (1) define a practical framework for conducting comprehensive river-quality assessments, (2) develop and document methods for evaluating basin-development alternatives in terms of potential impacts on river quality, (3) determine the kinds and amounts of data required to adequately assess various types of river quality problems, and (4) apply the framework, data, and methods to assess the existing or potential river-quality problems of the Willamette River basin. Considered herein are objectives 2, 3, and 4, by examining the rationales behind the selection and application of methods and the design of data programs for assessing specific river-quality problems. The rationales are those developed for assessing (1) the effect of population and industrial growth and resulting waste discharges on river-dissolved oxygen, (2) the potentially harmful effects on land and river quality of accelerated erosion resulting from intensive land-use development, and (3) the potential for nuisance algal growth. The goal of the assessment program and, thus, the context of the rationales is to provide technically sound information that is appropriate and adequate for resource planning and management. (Bell-Cornell)

W76-01334

A SYSTEMS ANALYSIS OF A CONTINUOUS WATER QUALITY MONITORING PROJECT,
Tennessee Univ., Knoxville. Water Resources Research Center.
R. E. Cronmiller.
Available from the National Technical Information Service Springfield, Va 22161 as PB-246 846, $4.50 in paper copy, $2.25 in microfiche. Research Report No 38, August 1974. 9 fig, 6 tab, 7 ref, 53 p. OWRT A-022-TENN(1).

Descriptors: *Water quality, *Monitoring, *Projects, Reservoirs, Tennessee River, Systems analysis, Equipment, Design, Operations, Reliability, Costs, Pumping, Economics, Installation, Telemetry, Personnel, Management.
Identifiers: Cost projection.

With the increased pollution potential of our waters, any water quality program should include continuous monitoring as a means of evaluating the environmental conditions of a water body. Such a procedure accurately measures and records chosen parameters at specified time intervals and location(s), primarily for achieving the objectives of pollution prevention and/or abatement. This paper reports on an investigation of the equipment, personnel, installation, and operation of a continuous water quality monitoring project at Fort Loudon Reservoir on the Tennessee River. The equipment options that were initially considered for the project are discussed in some detail in a state of the arts review. Considered also are some of the most popular system designs currently being employed today. The latter part of the study is concerned with a systems analysis of the project. Equipment design and operation are mentioned as the key factors in determining the overall success of a monitoring system. A cost projection of the project for a three-year duration and a comparison of these costs revealed that for a suitable monitoring system yielding reliable data, the operational functions will account for a major portion of the costs incurred. (Bell-Cornell)
W76-01342

ENVIRONMENTAL RECONNAISSANCE TECHNIQUES FOR CONNECTICUT RIVER BASIN WATERSHEDS,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 4D.
W76-01344

EXPERIENCE WITH THE DETERMINATION OF THE BIOCHEMICAL OXYGEN DEMAND WITH SPECIAL CONSIDERATION OF THE MODIFIED 'VIEHL DILUTION METHOD, (ERFAHRUNGEN MIT DER BESTIMMUNG DES BIOCHEMISCHEN SAUERSTOFFEBEDARFS UNTER BESONDERER BERUECKSIGHTIGUNG DER MODIFIZIERTEN VIEHL 'SCHEN VERDUENNUNGSMETHODE),
For primary bibliographic entry see Field 5D.
W76-01442

WATER POLLUTION MONITORING SYSTEM, (IN JAPANESE),
M. Matsuda, and Y. Takeda.
Nippon Denki Giho, (Technical Report of Nippon Electric Co.), No 2, p 73-81, March, 1975. 6 fig, 2 tab, 3 ref.

Descriptors: *Monitoring, *Water pollution, *Computers, Analytical techniques, *Pollutant identification, Heavy metals, Biochemical oxygen demand, Rivers, Lakes, Sewerage, Chemical oxygen demand, Data collections.

A system consisting of water pollution monitoring stations where data are collected on-line, and of a central monitoring station to which recorded cassette tapes are supplied for computer input has been developed in Japna. The stations are set up on rivers and lakes, ar sea, and at the point of plant sewerage discharge. Data obtained at the monitoring stations include pollutant concentrations, water temperature, flow rate, oxidation-reduction potential, and electric conductivity. Pollutants included cadmium and Cd compounds, cyanides, organic phosphorus compounds, lead and Pb compounds, Cr(VI) compounds, arsenic and As compounds, mercury and Hg compounds (including alkylmercury), suspended solids, phenols, Cu, Zn, soluble Mn, n-hexane extracts, flurides, coliform-group bacteria and BOD and COD. These were measured by standard Japanese (JIS) methods. Data were integrated at the central monitoring station by on-line, background, off-line, and backup computer operations. (Su-FIRL)
W76-01443

COMPARATIVE STUDY OF POLIOVIRUS CONCENTRATION METHODS FROM WATER (ESSAIS COMPARATIVES DE METHODES DE CONCENTRATION DU POLIOVIRUS APARTIR DES EAUX),
For primary bibliographic entry see Field 5D.
W76-01444

THE MEASUREMENT OF MLSS USING INTEGRATED SPHERICAL TYPE TURBIDIMETER, (IN JAPANESE),
Y. Ishihara, K. Tanaka, and H. Sunahara.
Mizushori Gijutsu, (Water Purification and Liquid Wastes Treatment), Vol 16, No 7, p 659-662, July, 1975. 5 fig, 1 ref.

Descriptors: *Measurement, *Analytical techniques, *Activated sludge, *Turbidity, Suspended solids, Pollutant identification, Waste water treatment.
Identifiers: Mixed liquor suspended solids(MLSS), Turbidimeters.

A pre-determined quantity of mixed activated sludge solution was sampled and diluted with water to a specified volume. After rapid stirring, the turbidity of the solution was measured by an integrated spherical type turbidimeter. The activated sludge in the solution was determined by a conventional method and a calibration curve was constructed. A standard solution of kaolin was used for the calibration of the turbidimeter. Results showed that both SEP-TW model and SEP-PT model turbidimeters gave satisfactory reproducibility and sensitivity. An ultra-sound wave method and a high speed mixer were found to give a homogeneously dispersed solution of activated sludge; a constant turbidity was obtained after 30 minutes of standing. Activated sludge at concentrations of up to 10,000 ppm can be measured by the turbidity method and any coloration of the sample solution with metal ions from zero to eight percent in concentration has no apparent effect on the determination. (Su-FIRL)
W76-01445

PHOSPHATE DEPENDENT FLOCCULANT DOSAGE AT PHOSPHORUS ELIMINATION FROM COMMUNAL WASTE WATER (DIE PHOSPHATFRACHT-ABHAENGIGE FAELIMITTEL-DOSIERUNG BEI DER PHOSPHOR-ELIMINATION AUS KOMMUNALEM ABWASSER),
For primary bibliographic entry see Field 5D.
W76-01446

5B. Sources Of Pollution

HEAT DISPOSAL IN THE WATER ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
D. R. F. Harleman.
Journal of the Boston Society of Civil Engineers Section, American Society of Civil Engineers, Vol 61, No 3, p 99-123, July 1974. 11 fig, 21 ref.

Descriptors: *Heat, *Disposal, *Water, *Environment, *Water quality, Temperature, Laboratory tests, Mathematical models, Analytical techniques, Diffusion, Buoyancy.
Identifiers: Prediction, Buoyant jets, Field observations.

The need for continuing development of techniques for predicting temperature distributions due to waste heat discharges into lakes, rivers, estuaries and the oceans is discussed. Emphasis is on the interactive role of basic laboratory experiments, analytical and numerical techniques and field observations. Diffusion of buoyant jets is discussed, including heated surface jets and multiple jets issuing from a submerged multiport diffuser. In the near-field analysis of surface jets the important problems are related to the lateral spreading caused by buoyancy. Comparison of theoretical predictions with laboratory and field observations is given. The mechanics of multiport diffusers for heated discharges in shallow receiving waters are discussed in contrast to sewage diffusers. The important problem is the degree to which stratification can be maintained in order to minimize local reintrainment and reduction of dilution capacity. Criteria for stable and unstable flow regimes are provided. A mathematical model for temperature distribution, with or without waste heat addition, in unsteady flows under time-varying meteorological conditions is given. Predictive techniques are needed in the preparation of environmental impact statements for pre-operational site studies in order to evaluate the economic and environmental costs of alternative cooling water system. (Bell-Cornell)
W76-01012

PHOSPHORUS IN THE RURAL ECOSYSTEM--RUNOFF FROM AGRICULTURAL LAND,
Wisconsin Univ., Madison.
R. Powell, and J. Densmore.
In: Proceedings of Conference on Farm Animal Wastes, Nitrates and Phosphates, in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, February 1-5, 1971, p 156-166. 9 tab, 1 ref.

Descriptors: *Phosphorus, *Agricultural runoff, Water pollution sources, Soil erosion, Fertilizers, Farm wastes, Ecosystems, Runoff.
Identifiers: Manure.

Public concern over pollution of the environment has increased considerably. Concern about water quality is foremost because the main result is visible degradation of the water, namely the growth of algae and weeds plus possible contamination of drinking water supplies. Estimates show that less than one-third of the phosphorus entering Wisconsin waters comes from agricultural land. Agricultural sources of phosphorus are mainly soil erosion, fertilizers and manures. Applications of these products on snow covered, sloping fields can be potential sources of phosphorus pollution. Incorporation of animal manures immediately after application conserves the nutrients and also reduces the soil erosion potential of a sloping field. Judicious placement of intensive feeding operations and careful handling of fertilizers and animal wastes will help to foster public relations between agriculture and her urban neighbors. (Cameron-East Central Oklahoma State)
W76-01017

THE ROLE OF THE WISCONSIN DEPARTMENT OF AGRICULTURE IN AGRICULTURAL POLLUTION PREVENTION AND CONTROL,
Wisconsin Dept. of Agricultural, Madison.
For primary bibliographic entry see Field 5E.
W76-01018

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PHOSPHORUS IN OUR ENVIRONMENT,
Wisconsin Dept. of Natural Resources, Madison.
J. M. Cain, and J. E. Kerrigan.
In: Proceedings of Conference on Farm Animal Wastes, Nitrates and Phosphates, in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, February 1-5, 1971, p 134-137. 5 ref.

Descriptors: *Phosphorus, *Fertilizers, Surface waters, Environment, Wisconsin, Nutrients, Water pollution sources, Soil erosion, Waste treatment.
Identifiers: *Manure.

Historical background, characteristics, and principal producers of phosphorus are discussed. A major concern is the increased concentration of phosphorus in surface waters. Manure and commerical fertilizers are the major sources of plant nutrients in Wisconsin. Estimates show that 48 percent of the total phosphorus supplied to Wisconsin crops was from manure. Much of the manure was applied on frozen ground so that it contributed significant quantities of soluble phosphorus to the spring runoff. Complications to the problem of phosphorus imbalance in the environment include such factors as the broad expanses of land and water involved, the low phosphorus concentrations at which problems occur in lake waters and the abundance and low cost of phosphorus which often preclude profitable recovery of phosphorus. The phosphorus problem must be considered as part of a group of interrelated problems of soil erosion, nitrogen fertilization, waste treatment, water use, and land use. (Cameron-East Central Oklahoma State)
W76-01019

SOIL POLLUTANTS AND THEIR EFFECTS ON CLEAN WATER,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W76-01020

ENVIRONMENTAL, ECONOMIC, AND PHYSICAL CONSIDERATIONS IN LIQUID HANDLING OF DAIRY CATTLE MANURE,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5E.
W76-01023

FEEDLOT WASTE MANAGEMENT SYSTEMS,
For primary bibliographic entry see Field 5E.
W76-01024

AVERT RUNOFF POLLUTION,
For primary bibliographic entry see Field 5D.
W76-01025

EXPERIENCE WITH A SPRAY-RUNOFF SYSTEM FOR TREATING BEEF CATTLE FEEDLOT RUNOFF.
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-01026

FEEDLOT POLLUTION,
Montana State Dept. of Health, Helena. Water Pollution Control Section.
For primary bibliographic entry see Field 5E.
W76-01027

AREA NEEDED FOR LAND DISPOSAL OF BEEF AND SWINE WASTES,
Iowa State Univ., Ames, North-Central Regional Extension Project.
For primary bibliographic entry see Field 5E.
W76-01029

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS,
Wisconsin Univ., Madison.
D. R. Keeney, and L. M. Walsh.
In: Proceedings of Conferences on Farm Animal Wastes, Nitrates and Phosphates in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, Feb 1-5, 1971, p 22-40, 4 fig, 8 tab.

Descriptors: *Nitrogen, *Nitrates, *Runoff, *Groundwater pollution, Rural areas, Ecosystems, Crops, Soils, Nitrogen compounds, Water pollution sources, Agricultural runoff.
Identifiers: Manure.

The most critical problem associated with nitrogen compounds in groundwater aquifers is the possible adverse health effects on humans and animals. All sources od nitrogen--precipitation, crop residues, soil organic matter, legumes, manure, and nitrogen fertilizer--are ultimately converted to the leachable NO3-N form by soil bacteria. Nitrogen can be lost from the soils by crop removal, leaching, denitrification, and runoff. Losses of soil material and total nitrogen are directly related to amount of runoff. Practices recommended for reduction of runoff losses include use of crop residues, application of animal manure in conjunction with crops, use of minimum tillage on slopes, and fertilization to stimulate early growth of crop. The total amount of NO3-N in the soil profile can be related directly to the rate of nitrogen application and frequency of the fertilized crop in the rotation. Methods for controlling the rate of pollution of underground water are given. Also given are methods of reducing nitrogen input into water. (Cameron-East Central Oklahoma State)
W76-01031

NATURE AND HISTORY OF THE NITRATE PROBLEM,
Missouri Univ., Columbia, Dept. of Veterniary Medicine and Surgery.
A. A. Case, G. Garner, G. E. Smith, and W. H. Pfander.
Science and Technology Guide, University of Missouri Extension Division, p 9800-9801. 1964.

Descriptors: *Nitrates, *Nitrites, *Farm wastes, *Pollutants, *Water pollution, *Forages, Corn belt, Water pollution sources, Poisons, *Water pollution effects.
Identifiers: Methomoglonemia, Fuming silos, Animal wastes.

Excessive nitrate content of forage plants and 'loaded' water supplies is being recognized in the corn belt states (Kansas, Iowa, and Missouri) as a serious problem. The major cause of these excessive nitrates seems to be animal wastes. Fuming silos are another source of nitrate poisoning. Fuming silos are grain storage silos which give off an often lethal gas during the filling and a week or so afterwards. This gas comes from forage that contains excessive amounts of nitrate or nitrite, but the amount doesn't have to be very high. Juice draining from fuming silos is also a dangerous toxic agent for anything exposed to it. Nitrate poisoning of human infants and of livestock is discussed. Symptoms are described. (Drewry-East Central Oklahoma State)
W76-01033

SLUDGE DISPOSAL: A CASE OF LIMITED ALTERNATIVES.
For primary bibliographic entry see Field 5D.
W76-01035

MANURE WASTE PONDING STUDY,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5D.
W76-01038

RUNOFF CONTROL SYSTEMS FOR CONCRETE DAIRY CATTLE YARDS,
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
C. O. Cramer, T. J. Brevik, G. H. Tenpas, and D. A. Schlough.
Presented at the 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974; Paper No. 74-4016, 23 p, 11 fig, 6 tab, 7 ref.

Descriptors: *Runoff, *Control, *Cattle, *Dairy industry, *Waste storage, *Waste disposal, Effluents, Precipitation, Sampling, Chemical characteristics, *Agricultural runoff, Water pollution sources
Identifiers: *Paved yards.

Two sites were chosen for study of runoff control systems for paved dairy yards. One system, at the Holwis farms, was for 200 head of milking cows plus heifers in a cold free stall farm. The other system, at the UW Ashland Experimental farms, contained 32 cows in a stanchion barn with paved exercise yard. Both systems were very similar with the same principles of solids separation, liquid storage, and land application. Analyses were made on the detention pond effluent and the separated solids. The Holwis farm collected 45 and 49% of the rain on the paved and unpaved yards and roof areas for the two years of study with 2.7 and 1.7 million gallons of effluent being removed. The Ashland farm collected 84, 67, and 71% of the rain for eight months of study with 0.6 and 0.5 million gallons of effluent being removed during the two years. Metal screens proved to be better than porous rock-filled dams for solid separation. Analyses of the retention pond effluent showed considerable variation in content. The detention ponds in both systems were designed with insufficient capacity to allow effluent to be applied only when soil conditions were favorable. The runoff control systems described required considerable labor and management. (Russell-East Central Oklahoma State)
W76-01039

FIELD PERFORMANCE OF SELECTED BEEF FEEDLOT WASTE HANDLING SYSTEMS,
Illinois Univ., Urbana-Champaign.
For primary bibliographic entry see Field 5E.
W76-01040

CATTLE FEEDLOT POLLUTION STUDY,
Texas Tech. Univ., Lubbocks. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W76-01045

CHANGES WE'VE MADE IN MANURE HANDLING.
For primary bibliographic entry see Field 5E.
W76-01046

WATER QUALITY OF STORM RUNOFF FROM A TEXAS BEEF FEEDLOT,
Texas A and M Univ., College Station.
G. G. Wise, III.
MS Thesis, August, 1972, 166 p, 34 fig, 79 tab, 28 ref.

Descriptors: *Water quality, *Storm runoff, *Texas, *Feed lots, *Cattle, Sampling, Equipment, Chemical oxygen demand, Phosphorus, Nitrogen, Potassium, Sodium, Chloride, Slope, Waste treatment, Water pollution.

One of the major sources of pollution from high density beef feedlots is storm runoff. Efforts were made to determine the variation in chemical and physical properties of storm runoff from a beef feedlot area of Texas and to correlate the water quality variations with storm characteristics and hydrologic properties of the feedlot drainage area.

The average concentrations of water quality parameters in the feedlot runoff did not change as much with variations in rainfall intensities, runoff rates, and runoff volumes as indicated by similar runoff studies. The concentrations of COD, phosphorus, and Kjeldahl nitrogen in the runoff were directly related to the total soils concentration. The concentrations of filterable solids, potassium, sodium and chloride were greater when the contact time between the surface and the runoff was increased. The higher average concentrations of total solids, COD, phosphorus, and Kjeldahl nitrogen, and lower average concentrations of filerable solids, potassium, sodium, and chloride from one area were due to the greater slope causing an increased sediment load and decreasing the contact time between the runoff and the feedlot surface. (Russell-East Central Oklahoma State)
W76-01089

CONTROLLING SEDIMENT AND NUTRIENT LOSSES FROM AGRICULTURAL LANDS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
J. J. Jacobs.
Cornell Agricultural Economics Staff Paper No 72-20, September, 1972, 16 p, 2 fig, 4 tab, 20 ref.

Descriptors: *Sediment control, *Nutrients, *Agriculture, *Phosphorus, Farm wastes, Livestock, Water pollution sources, Runoff, Model studies, Costs.

Sources of potential pollutants from agricultural production are: sediment from erosion; plant nutrients; livestock manure; pesticides; waste from processing plants; and air pollution, primarily odors and dusts. Sediment and phosphorus were selected for intensive study because of the magnitude of sediment as a pollutant, the increased emphasis on phosphorus as a likely key nutrient in limiting growth of aquatic plant life, and the diffuse sources of such pollutants from agricultural runoff as compared to point sources. Surface runoff from agricultural cropland is the primary transport agent of sediment entering surface waters. Therefore, planning for the control of sediment requires knowledge of the relations between those factors that cause loss of soil and those that help reduce such losses on cropland. The methods allowed for controlling sediment and phosphorus losses are presented. The question of which control methods and at what level depends on the level of water quality desired, the unit cost coefficients of alternative methods, and the technical coefficients of the alternative methods. A summary of the cost coefficients is presented. Sediment and phosphorus coefficients were also estimated for each management system listed. (Cartmell-East Central Oklahoma State)
W76-01090

ABANDONED FEEDLOTS CAN POLLUTE MORE THAN ACTIVE ONES.
Crops and Soils Magazine, Vol 27, No 3, p 23, December, 1974.

Descriptors: *Feed lots, *Nitrogen, Cattle, Livestock, Water pollution sources, Nitrates.

Lloyd N. Mielke, U. S. Department of Agriculture and University of Nebraska soil scientist, has been conducting a study of the nitrate concentrations beneath feedlots. Under abandoned feedlots, he found an average concentration of 3.2 tons of nitrates per acre in the top 30 feet of the soil. Under active feedlots, he found only 0.8 tons per acre. The makeup of the surface of the feedlot is the reason for this difference. Active feedlots have an impenetrable seal on the surface that prevents air and water from getting through. The nitrogen under this seal is kept in a relatively immobile organic form. (Cameron-East Central Oklahoma State)
W76-01095

ZETA POTENTIAL STUDIES OF COLLOIDAL SUSPENSIONS FROM A BEEF CATTLE FEEDLOT SURFACE,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
J. C. Lorimor.
MS Thesis, 1969, 59 p, 12 fig, 12 tab, 29 ref.

Descriptors: *Zeta potential, *Feed lots, *Cattle, Runoff, Water pollution, Hydrogen ion concentration, Irrigation, Waste water treatment, Sampling, Temperature, Statistical models, Farm wastes.
Identifiers: *Colloidal suspensions, Quadratic equations, Alum.

Runoff from beef cattle feedlots is one source of potential water pollution. Two alternatives are available to prevent feedlot runoff from polluting streams: (1) the water can be spread on agricultural land as irrigation water. or (2) it can be treated before it is released to the streams. Zeta potentials on colloidal solids in feedlot water samples were investigated as one method of treatment control. Zeta potentials average -29.5 millivolts on untreated samples. The potentials varied with pH and solids concentrations according to theory. Particle zeta potentials were controlled by chemical treatments and high chemical dosages were required to reduce the zeta potentials to near the isoelectric point. Quadratic equations could be written to accurately define the relationships between zeta potentials, solids concentrations, and pH and between zeta potentials, chemical dosages, and solids concentrations. (Russell-East Central Oklahoma State)
W76-01096

OXIDATION OF CINNABAR BY FE (III) IN ACID MINE WATERS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2K.
W76-01099

EVIDENCE FOR THE OCCURRENCE OF SPECIFIC IRON (III)-BINDING COMPOUNDS IN NEAR-SHORE MARINE ECOSYSTEMS,
Texas Univ., Port Aransas. Marine Science Inst.
M. Estep, J. E. Armstrong, and C. Van Baalen.
Applied Microbiology, Vol 30, No 2, p 186-188, August 1975, 1 tab, 10 ref.

Descriptors: *Heavy metals, *Iron, *Absorption, *Marine algae, *Marine plants, *Bioassay, Aquatic bacteria, Cultures, Ecosystems, Chromatography, Chalation, Biota, Algae.
Identifiers: *Blue-green algal mat, *Sea grass, *Siderachromes, *Secondary hydroxamic acids, *Arthrobacter JG-9, Iron binding compounds.

The siderochrome auxotroph JG-9 was used in a bioassay to determine the amount of secondary hydroxamic acids (specific iron chelators) present in aqueous extracts of near-shore marine samples. The samples included blue-green algae mats and sea grass, which gave strongly positive responses. The samples were homogenized or minced in distilled water and filtered. The filtrate was concentrated and applied to filter paper discs which were applied directly to seeded JG-9 plates. The places were incubated and growth measured by diameter of zone as compared to growth of cultures on plates with known Desferal (methane sulfonate of iron-free ferrioxamine B) standards. Results indicate significant amounts of iron-binding compounds present in blue-green algal and sea grass samples. The hydroxamate type of iron chelator present may be important in providing a form of iron in sea water readily utilized by the microalgae and marine higher plants. (Davis-Vanderbilt)
W76-01101

ROLE OF BACTERIA IN BIOACCUMULATION OF MERCURY IN THE OYSTER CRASSOSTREA VIRGINICA,
Maryland Univ., College Park. Dept. of Microbiology.
G. S. Sayler, J. D. Nelson, Jr., and R. R. Colwell.
Applied Microbiology, Vol 30, No 1, p 91-96, July 1975, 3 fig, 5 tab.

Descriptors: *Mercury, *Pseudomonas, *Oysters, *Food chains, *Tracers, *Heavy metals, *Chesapeake Bay, Absorption, Bacteria.
Identifiers: Gamma counting, Bioaccumulation.

The role of mercury-resistant bacteria in the uptake of mercury by oysters was investigated. Oysters were maintained in a closed system, sealed aquarium with stirred, aerated water containing 10 micrograms of 203 $HgCl_2$ per liter. Uptake of 203 Hg by oysters held under control conditions was compared with that of 203 Hg uptake by oysters under similar conditions except that mercury-accumulating and mercury-metabolizing aspects of Pseudomons isolated from Chesapeake Bay, were added to the experimental oysters. Mercury concentrations were determined by measuring tissue and fluid radioactivity in a spectrophotometer equipped with an an auto-gamma spectrometer. Mercury accumulation was significantly greater in oysters in the presence of the experimental bacteria. The concentration of mercury was greater in the gill and visceral tissue than other oyster tissues. (Davis-Vanderbilt)
W76-01102

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics; and Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
F. M. M. Morel, J. C. Westall, C. R. O'Melia, and J. J. Morgan.
Environmental Science and Technology, Vol 9, No 8, p 756-761, August, 1975. 4 fig, 3 tab, 14 ref.

Descriptors: *Heavy metals, *Trace elements. *Pollutants, *Pollutant identification, *Equilibrium, Chemical precipitation, Waste water disposal, Water pollution, Water quality, Sewage effluents, Analytical techniques, Model studies, Solubility.
Identifiers: *Los Angeles County, *Chemical speciation, *Sewage particulate, *Sewage dilution, *Equilibrium models, Ocean outfalls.

An equilibrium model is presented of trace metal movement from an ocean outfall. The chemical speciation of trace metals as they reach the ocean from the Los Angeles sewage system is discussed. A study of the oxidation and dilution of the sewage by seawater demonstrates that most metals tend to be solubilized upon disposal in the ocean and that unmeasurable increments in the natural metal concentrations should result in the farfield. It is hypothesized that the sewage particulate is not mobilized in the vicinity of the outfall and that the nearby sediments are a mixture of naturally occurring sediments and sewage particulate. About 0.5% of the sewage particulate (and its metal content) can be accounted for in the reduced area on the ocean floor around the county outfall system. The study points out important research needs in the area of analytical chemistry of wastewaters and in the area of physical transportation processes in coastal waters. (Davis-Vanderbilt)
W76-01104

NUTRIENT AND SEDIMENT DISCHARGE FROM AGRICULTURAL WATERSHEDS IN OKLAHOMA,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 2A.
W76-01116

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PHOSPHORUS IN SURFACE RUNOFF FROM A DECIDUOUS FOREST,
Minnesota Univ., St. Paul. Dept. of Soil Science.
M. J. Singer, and R. H. Rust.
Journal of Environmental Quality, Vol 4, No 3, p 307-311, 1975. 4 fig, 2 tab, 26 ref.

Descriptors: *Phosphorus, *Rainfall-runoff relationships, *Eutrophication, *Surface runoff, *Deciduous forests, Minnesota, Snowmelt, Forest soils, Soil erosion.
Identifiers: Lake Minnetonka(Minn).

Phosphorus loss in surface runoff from a deciduous forest ecosystem was determined in Lake Minnetonka, Minnesota, watershed. Runoff was highest in March due to melting snowpack, in May due to continuous heavy rains, and in July due to intense short duration rains on dry soil. Runoff in other months was related to rainfall amount, intensity, and soil moisture. Most small storms did not precipitate runoff. Intense storms often exceeded the soil's infiltration rate, dislodged soil particles, with consequent runoff. The canopy reduced precipitation intensity and amounts reaching the soil surface. Forest litter had a large water holding capacity and rapid infiltration rate which protected soil mineral from direct rainfall impact and reduced runoff. Any melting snow in December-January saturated lower snow layers but did not create runoff. Spring runoff volume was determined by snowpack depth, water content, air temperature, and presence or absence of frozen soil surfaces. Yearly runoff volume and timing varied greatly. March runoff had more phosphorus but in other months phosphorus concentration was inversely related to runoff volume. Sediment phosphorus loss was linearly correlated with maximum precipitation. Care should be given in extrapolating the findings for the rate of phosphorus loss from the test plot to an entire forest. (Buchanan-Davidson--Wisconsin)
W76-01145

NITRATE, PHOSPHORUS, AND SULFATE IN SUBSURFACE DRAINAGE WATER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
J. L. Baker, K. L. Campbell, H. P. Johnson, and J. J. Hanway.
Journal of Environmental Quality, Vol 4, No 3, p 406-412, 1975. 2 fig, 4 tab, 17 ref.

Descriptors: *Eutrophication, *Tile drainage, *Groundwater, *Nutrients, Nitrates, Nitrogen, Sulfates, Phosphorus, Phosphates, Subsurface drainage, Fertilization, Flow rates, Agriculture, Iowa.
Identifiers: Skunk River(Iowa).

To determine nutrient losses associated with subsurface drainage water and the effect fertilization rate has on these losses, measurements were made of flow, nitrate-nitrogen, phosphate-phosphorus, total phosphorus, and sulfate-sulfur in subsurface drainage water from tile-drained cropland in Iowa. Annual nutrient losses were variable; phosphorus, sulfate-sulfur, and nitrate-nitrogen losses ranged from 0 to 0.04, 0 to 32, and 0 to 93 kg/ha, respectively, and were dependent on amount of water lost. Because of low phosphorus concentrations, losses with subsurface drainage water were insignificant compared to losses associated with surface runoff. Sulfate-sulfur and nitrate-nitrogen concentrations appeared to be inversely related. Tile drainage water with consistently high nitrate-nitrogen relative to surface runoff was believed responsible for high nitrate-nitrogen contents sometimes found in rivers draining central Iowa. Nitrate from saturated and unsaturated soil indicated that water waves or pulses with different nitrate-nitrogen concentrations move through the soil causing variations in subsurface drainage water with time and flow rate. The large amounts of nitrate-nitrogen lost from some tile drains with modest fertilization and variations in tile drains make it impossible to ascribe nitrate-nitrogen loss to fertilizers alone. Nitrate-nitrogen loss represents an economic and energy waste as well as an environmental hazard. (Buchanan-Davidson--Wisconsin)
W76-01146

WATER POLLUTION FROM AGRICULTURE,
Kungliga Lantbrukshogskolan, Uppsala (Sweden).
N. Brink.
Journal Water Pollution Control Federation, Vol 47, No 4, p 789-795, 1975. 3 fig, 9 tab, 1 ref.

Descriptors: *Agricultural runoff, *Water pollution, Fertilizers, Farm wastes, Groundwater, Urine, Livestock, Nitrogen, Phosphorus, Nitrates, Nutrients, Water pollution sources, Europe, Feeds, Feed lots, Sludge, Silage.
Identifiers: Sweden.

Risks of surface and groundwater pollution in Sweden are increasing due to increased livestock production and use of commercial fertilizers in agriculture. Urine and silage juice are especially rich in organic contaminants. Wastewater from dwellings in usually treated in septic tanks before release into open water or infiltration into the ground. To prevent water pollution, manure and silage juice should be spread on arable land. The application of sewage sludge as a fertilizer should not exceed 150 tons/ha in wet form and be spread at widely spaced intervals. Urine, dungyard water, liquid manure, and silage juice may leak into surface and groundwater from animal stables. Commercial fertilizer use has increased thus climatic and soil factors are crop growth limiting. Nitrogen is mostly in the form of nitrates, with very small amounts of ammonia. Phosphorus is sometimes very high in groundwater. Chemical reduction probably a role in deeper layers, especially in clay soils. The nitrogen budget for a field at Nasbygard, Sweden is given; most of the input went to grain, some to air and water. Neither burning of straw nor excessive fertilizer is acceptable husbandry. (Buchanan-Davidson--Wisconsin)
W76-01162

PHOSPHORUS IN NEW YORK STATE RIVERS: SOURCES, SINKS, AND DETERGENTS,
State Univ. of New York at Binghamton. Dept. of Chemistry.
J. T. Haney.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 983, $4.50 in paper copy, $2.25 in microfiche. Report SS-306 (NSF-RA-G-73-032), August 1973. 58 p. 8 fig, 9 tab, 39 ref.

Descriptors: *Eutrophication, *Phosphorus, *Rivers, *Detergents, *Water pollution sources, *New York, Sinks, Input-output analysis, Runoff, Land use, Absorption, Watersheds(Basins), Sediments, Sewage effluents, Model studies, Land management.
Identifiers: Mass balances, Susquehanna River(NY), Genessee River watershed(NY), Allegheny River watershed(NY), Mohawk River watershed(NY).

Phosphorus levels in New York rivers considerably exceeded the phosphorus concentrations in lakes. Municipal wastewaters were especially important, but removal of phosphorus from detergents should substantially reduce phosphorus inputs. Mass balances (inputs versus outflow for a one year period), using phosphorus runoff factors, according to land use and per capita sewage for phosphorus in seven New York watersheds, including basins of the Susquehanna, Genesee, Allegheny, and Mohawk Rivers, showed qualitative agreement. Data on sewage discharges, sediment characteristics, and river phosphorus uptake for the Susquehanna River were collected and a model of phosphorus load versus river miles constructed; this agreed with measured phosphorus loads. Phosphorus reduction in municipal wastewaters due to a ban on phosphate detergents and better land management practices will help. An integrated approach to waste disposal is needed so that nutrient removal from effluents can be coordinated with river models and biological impacts to determine the size and location of discharges in order to minimize their effects. (Buchanan-Davidson--Wisconsin)
W76-01170

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-01176

GEOHYDROLOGY AND WATER QUALITY OF THE MISSISSIPPI RIVER ALLUVIAL AQUIFER, NORTHEASTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 2F.
W76-01180

BENTHIC FAUNA AND ZOOPLANKTON IN SOME POLLUTED SWEDISH ESTUARIES,
Uppsala Univ. (Sweden). Inst. of Zoology.
I. Olsson, R. Rosenberg, and E. Olundh.
Ambio, Vol 2, No 5, p 158-163. 1973. Illus.
Identifiers: *Benthic fauna, Corer, Diversity, *Estuaries, Gradients, Outflows, Plankton, Rivers, *Salinity, *Zooplankton, *Sweden.

Meiofauna (0.1-1 mm), macrofauna (>1 mm) and zooplankton (> 0.16 mm) in 4 Swedish estuaries were sampled with piston corer, Smith-McIntyre grab and Nansen net, respectively. The faunal communities were evaluated by indicies. The diversity of the meiofauna reflected differences in pollution rather than differences in salinity. A combined effect of pollution and reduced salinity gave a lower macrofaunal diversity outside river mouths. The meio- and macrofaunal composition was often similar between the various estuaries than within individual estuaries, reflecting the steep gradient caused by river outflow with effluents. The zooplankton fauna was almost uniform in all the estuaries.--Copyright 1974, Biological Abstracts, Inc.
W76-01194

MATHEMATICAL MODELLING OF AN AQUATIC ECOSYSTEM: I,
Wright State Univ., Dayton, Ohio.
N. N. Gupta, and J. Houdeshell.
Int J Syst Sci. Vol 4, No 5, p 765-770. 1973. Illus.
Identifiers: Aquatic systems, *Ecosystem, *Mathematical models, Nutrients, Phytoplankton, Zooplankton, *Model studies, Biodegradation.

A mathematical model of an aquatic ecosystem is presented. The model differs from previous models in that it incorporates characteristics of specific phyla of phytoplankton and zooplankton, inter- and intra-phyla interaction and limiting nutrient processing by decomposers.--Copyright 1974, Biological Abstracts, Inc.
W76-01195

INDUSTRY WASTE STUDY. THE HAWAII SUGAR INDUSTRY WASTE STUDY.
Environmental Protection Agency, San Francisco, Calif. Region IX.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 931, $5.50 in paper copy, $2.25 in microfiche. June, 1971. 115 p, 34 fig, 18 ref, 9 tab.

Descriptors: *Hawaii, *Industrial wastes, *Sugarcane, *Water pollution, Water pollution sources, Wastes, Surface runoff, Water quality control, Bacteria, Coliforms, Suspended solids, Chemical oxygen demand, Nitrogen, Phosphorus,

Waste water, Water quality standards, Irrigation water, Storm runoff, Nutrients, Water pollution control, Sea water.
Identifiers: *Sugar industry, Sugar refining, Bagasse.

Wastes generated by agricultural activities in Hawaii, particularly sugar mill operations, are creating significant water pollution problems which threaten the tourist industry. A preliminary industrial process survey was made of all 26 sugar mills located in the State of Hawaii, and detailed in-plant surveys were carried out in 3 mills. The results show that sugar mill waste water (mill processing water and cane-wash water) as well as irrigation water and storm water runoff from fields contain large amounts of oxygen-consuming materials, suspended solids, nutrients, and bacteria. Average sugar production at each of the 3 mills was 210 tons/day and effluent flow rates were between 5 and 10 million gal/day. The mill water contained, per ton of raw sugar produced, an average of 1,850 lb of suspended solids, 1 750 lb of settleable solids, 650 lb of oxygen-consuming material (as measured by COD), 12 lb of total nitrogen, and 5 lb of phosphorus. The bacterial densities found in the wash waters average 4,850,000 total coliform organisms and 130,000 fecal coliform organisms/100 ml. At least 8 of the mills on the island of Hawaii and 2 mills on the island of Kauai discharge cane trash and/or bagasse to the ocean. To enhance water quality to the level described in the Water Quality Standards of the State of Hawaii in those areas influenced by discharges from sugar plantations, the following changes in operating conditions should be made: the discharge of trash and bagasse to coastal waters should be discontinued; all discharges should be treated or controlled; and efforts should be made to control excess irrigation and storm runoff waters. (Witt-IPC)
W76-01224

BASICS OF POLLUTION CONTROL.
Gurnham and Associates, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-01228

LIMITED ARSENIC DISPERSION IN SEA WATER, SEDIMENTS, AND BIOTA NEAR A CONTINUOUS SOURCE,
Fisheries and Marine Services, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5C.
W76-01262

DOMESTIC SOURCES OF STREAM PHOSPHATES IN URBAN STREAMS,
Windsor Univ., (Ontario). Dept. of Geography.
P. D. La Valle.
Water Research, Vol 9, No 10, p 913-915, October 1975. 3 tab, 12 ref.

Descriptors: *Regression analysis, *Phosphates, *Water pollution sources, Fertilizers, Detergents, Domestic wastes, Water pollution, Urbanization, Sampling, Analysis, Chemical analysis, Water analysis, Rainfall, Septic tanks, Sewers, Census, On-site investigations, On-site data collections.
Identifiers: *Windsor(Canada), *Urban streams, Residential areas.

To assess the relationships between stream orthophosphate, stream polyphosphate concentrations, and possible domestic sources, a random sample of 24 drainage basins dominated by residential land use activities was studied. Stream orthophosphate and polyphosphate data were then correlated with the following variables: (1) mean garden fertilizer use (kg/yr), (2) mean phosphate detergent used (kg/month), (3) per cent watershed households connected to city sewers, (4) precipitation phosphate concentration. When a multiple regression analysis was run on the phosphate data, 76% of the variation in stream orthophosphate concentrations was accounted for by the percentage of watershed households connected to city sewers parameter, while garden fertilizer use and precipitation phosphate content accounted for 4 to 2% of the variation respectively. In a similar analysis of stream polyphosphate concentrations, a combination of detergent use and the percentage of watershed households connected to city sewers accounted for 48% of the total variation of stream polyphosphate concentrations. (Lardner-ISWS)
W76-01263

ASSESSING UNRECORDED ORGANIC POLLUTION FROM AGRICULTURAL, URBAN, AND WOODED LANDS,
Rutgers--The State Univ., New Brunswick, N.J.
S. L. Yu, W. Whipple, Jr., and J. V. Hunter.
Water Research, Vol 9, No 10, p 849-852, October 1975. 5 fig, 4 tab, 9 ref.

Descriptors: *Biochemical oxygen demand, *Water pollution, *Organic wastes, *Water pollution sources, *Regression analysis, *New Jersey, Streamflow, Frequency analysis, Watersheds(Basins), Runoff, Sampling, Analysis.
Identifiers: Wooded areas, Agricultural areas, Urban areas.

An investigation was conducted of the organic pollution for seven small New Jersey watersheds representing agricultural, urban, and wooded lands. The 5-day biochemical oxygen demand (BOD) was used as a main index of organic pollution. Data obtained for 2.5 yr period indicated background BOD concentrations averaging from 0.5 to 2.0 mg/1 in all streams, except that a value of 9.0 mg/1 was obtained for a residential-commercial-industrial area. During or after rainstorms, the BOD loadings, in pounds per day per unit area, usually became more than ten times the background amount for all streams. No significant correlation was found between BOD concentration and flow rate, but good correlations were obtained between BOD loadings and flows. The seasonal pattern of BOD loading distribution was examined. The frequency distribution of BOD concentrations and loadings were also obtained. (Lardner-ISWS)
W76-01264

LIMITATIONS OF THE ELECTRICAL RESISTIVITY METHOD IN LANDFILL INVESTIGATIONS,
G. Klefstad, L. V. A. Sendlein, and R. C. Palmquist.
Ground Water, Vol 13, No 5, p 418-427, September-October 1975. 10 fig, 1 tab, 23 ref.

Descriptors: *Resistivity, *Landfills, *Water pollution, *Leachate, *Geologic investigations, *Iowa, *Pollutant identification, Physical properties, Electrical resistance, Solid wastes, Pollutants, On-site investigations, On-site data collections, Exploration, Water quality.
Identifiers: *Groundwater contamination, *Leachate detection, *Electrical resistivity method, Isoresistivity maps, Isoconcentration maps.

The electrical resistivity method was used to delineate shallow zones of groundwater contamination resulting from solid waste disposal sites. Application of this method to sites located in alluvial deposits in Iowa revealed that the degree of success of the method was directly related to the degree of contamination. A detailed investigation of the interrelationship between electrical resistivity, material variation, and water quality was conducted in the alluvial deposits of the Skunk River at Ames, Iowa. The lateral variation of materials at this site resulted in a large, natural scatter in the resistivity response. The decrease in resistivity due to contamination was not greater than this natural scatter and thus could not be detected. These results suggested a relationship between the scatter levels at any site and the minimum degree of contamination necessary to be detected. The minimum level of contamination which can be detected over the natural scatter was called the threshold value. The threshold value must be known before the resistivity method can be applied with confidence. (Sanderson-ISWS)
W76-01268

HYDROGEOLOGIC EVALUATION OF SOLID WASTE DISPOSAL IN SOUTH CENTRAL WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W76-01273

THE IMPORTANCE OF ACCURATE CURVE NUMBERS IN THE ESTIMATION OF STORM RUNOFF,
Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 2A.
W76-01305

CLASSIFYING STORM RUNOFF POTENTIAL WITH PASSIVE MICROWAVE MEASUREMENTS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 7B.
W76-01306

URBANIZATION IMPACT ON WATER QUALITY DURING A FLOOD IN SMALL WATERSHEDS,
Wisconsin Univ., Milwaukee, Dept. of Geological Sciences.
For primary bibliographic entry see Field 4C.
W76-01307

SOIL EROSION ON SELECTED HIGH CLAY SUBSIOLS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W76-01308

COMPARISON OF WARM WATER EVAPORATION EQUATIONS,
Canterbury Univ., Christchurch (New Zealand), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W76-01310

THE ELIMINATION OF PHOSPHATES AND NITRATES OF WASTE WATER BY ALGAE CULTURES: I (/N FLEMISH),
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Anorganiche Technische Chemie, Elektrotermie en Elektrochemie.
For primary bibliographic entry see Field 5D.
W76-01312

CONSTRUCTION OF A SPILL CHANNEL AND EXPERIMENTAL DETERMINATION OF SPILL SPREADING RATES OF FOUR NON-HAZARDOUS CHEMICALS ON WATER.
Lowell Technological Inst., Mass. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W76-01320

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS, FEBRUARY 1973,
Canada Centre for Remote Sensing, Ottawa (Ontario). Data Acquisition Div.
For primary bibliographic entry see Field 5A.
W76-01324

LIBRARY U. OF I. URBANA-CHAMPAIGN

A SURVEY FOR THE USE OF REMOTE SENSING IN THE CHEMICAL BAY REGION,
Maryland Univ., Solomons. Chesapeak Biological Lab.
R. E. Ulanowicz.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-10571, $5.00 in paper copy, $2.25 in microfiche. Chesapeake Research Consortium Publication No 6, June 1974. 89 p.

Descriptors: *Remote sensing, *Chesapeake Bay, *Bays, *Estuaries, Nutrients, Thermal pollution, Industrial wastes, Pesticides, Industrial plants, Erosion, Wetlands, Land use, Meteorology, Solid wastes, Satellites(Artificial), Radar.
Identifiers: Data collection platforms.

Twelve environmental problem areas concerning the Chesapeake Bay region were reviewed along with ongoing remote sensing programs pertaining to these problems. Forty-three recommendations were presented to help fill lacunae in present research and to utilize the remote capabilities of NASA to their fullest. A list of interested organizations and individuals was presented for each category. Among the recommendations were the development of technologies to monitor dissolved nutrients in Bay waters, the initiation of a census of the disappearing rooted aquatic plants in the littoral zones, and the mapping of natural building constraints in the growth regions of the states of Maryland and Virginia. (Sims-ISWS)
W76-01327

STOCHASTIC ANALYSIS AND CONTROL OF URBAN ESTUARINE WATER-QUALITY SYSTEMS: VOL I--ESTIMATION AND PREDICTION,
New York City, Rand Inst. N.Y.
For primary bibliographic entry see Field 5G.
W76-01340

A SYSTEMS ANALYSIS OF A CONTINUOUS WATER QUALITY MONITORING PROJECT,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W76-01342

ANIMAL WASTES AND FERTILIZERS AS POTENTIAL SOURCES OF NITRATE POLLUTION OF WATER,
Agricultural Research Service, Fort Collins, Colo.
F. G. Viets, Jr.
In: Effects of Agricultural Production on Nitrates in Food and Water with Particular Reference to Isotope Studies, Vienna, International Atomic Energy Agency, p 63-76, 1974. 1 tab, 32 ref.

Descriptors: *Farm wastes, *Water pollution, *Nitrates, *Fertilizers, Hydrology, Nitrification, Infiltration, Eutrophication, Agricultural runoff, Ammonia, Volitalization.
Identifiers: Isotopic nitrogen.

An updating and supplementing of the U.S. Department of Agricultural Handbook 413, 'Factors Affecting the Accumulation of Nitrate in Soil, Water, and Plants' (Viets and Hageman, 1971) are provided. A change from vegetable protein to animal protein in the human diet has resulted in the increased use of nitrogen fertilizer in the developed countries for the last 30 years. Stocking rate and the continuity of use of the feed-yard or holding area appear to be the factors upon which nitrate percolation to aquifers depend. Because of inhibited nitrification and infiltration, modern high-density cattle feed-yards have low nitrate flux. Volatilization of ammonia and its absorption by surface water may contribute to eutrophication and nitrate accumulation. Nitrate leakage occurs under highly productive cultivated land regardless of the nitrogen source. Fertilization management must hold this leakage to a tolerable concentration in relation to hydrology and use of underground water in the area. There is a need for better understanding of land productivity, nitrate leakage, and hydrology. Assistance in solving these problems may be obtained from isotopic nitrogen. (Kehl-East Central Oklahoma State)
W76-01377

THE NITROGEN STATUS BENEATH BEEF CATTLE FEEDLOTS IN EASTERN NEBRASKA,
Department of Agriculture Lincoln, Nebr.
J. R. Ellis, L. N. Mielke, and G. E. Schuman.
Soil Science Society Proceedings of America, Vol 39, No 1, p 107-111, January-February, 1975. 4 fig, 2 tab, 19 ref.

Descriptors: *Farm wastes, *Feed lots, *Nitrogen, *Soil profile, *Nebraska, Cattle, Soil contamination, Groundwater, Water pollution sources, *Path of pollutants.

The majority of the beef consumed in the United States comes from cattle fed in large, open, soil-surfaced feedlots in the Plains States and the Midwest. Feedlots are point sources of nitrogen since they provide intensive land use. The effects of beef-feedlot management systems on N accumulation in the soil profile and ground water were examined. Fifteen sites were selected in eastern Nebraska. Core samples were taken from feedlots, cropland-cattle-use areas and from cropland adjacent to feedlots to evaluate the effects of different management practices on the movement and accumulation of nitrogen in the soil profile. The soil texture of the feedlots sampled ranged from clay to coarse sand with the age of the feedlots ranging from a few weeks to more than 50 years. The sites examined were ranked according to decreasing average NO3 -N in the core as follows: abandoned feedlot, feedlot-cropland, upland feedlot, corn (Zea mays L) river-valley feedlot, profiles under feedlot mounds, alfalfa (Medicago sativa L) grassland. Feedlot management is an important consideration in the accumulation of NO3 in the soil profile. (Kehl-East Central Oklahoma State)
W76-01381

LOCATING A NEW FEEDLOT,
Nebraska Univ., Lincoln.
E. A. Olson.
Cooperative Extension Service Report GPE-5/01, University of Nebraska, Lincoln, n.d. 4 p, 5 fig.

Descriptors: *Feed lots, *Locating, *Farm wastes, *Water pollution, Livestock, Regulation, Zoning, Topography, Water supply, Transportation, Marketing.

The selection of a site for a livestock feedlot directly affects the success of the feedlot. Factors to consider in choosing a feedlot location include: environmental considerations, streams, topography, water supply, land area, towns and zoning laws. Other items include a source of livestock and feed, transportation (roads) and marketing facilities. Finally the operator must determine the size to build with provision for expansion. (Cartmell-East Central Oklahoma State)
W76-01383

DISPOSAL OF FARM ANIMAL WASTES THROUGH THE SOIL,
Oregon State Univ., Corvallis.
M. G. Cropsey, and V. Van Volk.
Agricultural Engineering Annual Report of Research 1971-72, Agricultural Experiment Station, Oregon State University, Corvallis, 1972, 24 p. 1 fig, 14 tab.

Descriptors: *Waste disposal, *Cattle, *Dairy industry, *Irrigation, Slurries, Chemical properties, Water quality, Water pollution sources.
Identifiers: *Land disposal, *Waste water quality.

Disposal of livestock manure through an irrigation pumping system has proven economically successful, but some questions still need to be answered. The objective of this study was to determine the effect of large and frequent applications of dairy cow wastes on the soil. Another objective was to determine the quality of waste water in the soil and in the drainage water from such soil sites. The Oregon State University Dairy Farm was used for the study. It was determined that dairy manure slurry should not be applied the first year or two to a soil plot that has recently been installed with drain tile. This is advised because the slurry will short circuit through the freshly dug soil to the drain tile. When compared with the effluent applied there was a considerable reduction in TS, BOD and all forms of phosphorus and nitrogen in the dry wells and the drain tile. A considerable portion of both the liquids and solids was retained either in the soil or on the surface. The wind has considerable influence over the distribution of the manure water slurry. Recommendations for further investigation and some advice on application are given. (Kehl-East Central Oklahoma State)
W76-01384

CURRENT LIVESTOCK POLLUTION REGULATIONS,
For primary bibliographic entry see Field 5G.
W76-01385

TRANSFORMATIONS OF SWINE WASTEWATER IN LABORATORY SOIL PROFILES,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
L. F. McEver, F. J. Humenik, M. R. Overcash, and R. W. Skaggs.
Presented at 1974 Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No 74-2016, American Society of Agricultural Engineers, St. Joseph, Michigan. 19 p, 8 fig, 5 tab, 9 ref.

Descriptors: *Soil profiles, *Laboratory tests, Percolation, Nitrogen, Nitrates, Chemical oxygen demand, Water table, Liquid wastes, Hogs, Path of pollutants, *Waste water(Pollution).
Identifiers: *Loading rates.

The major objective was to investigate the transformations of swine waste lagoon effluent in packed and undistrubed Wagram soil columns with a shallow water table (36 inches). 70 percent of the wastewater nitrogen was converted to nitrate within the rooting zone (upper six inches) for loading rates of one and two inches per week with COD values ranging from 199 to 650 mg/l. While the organic materials moved through the soil with the soil water, a reduction in concentration with increased depth was observed. The organic portion of the swine wastewater was essentially stabilized after one week of storage in the upper soil regions. Almost complete removal (greater than 90 percent) of COD and TOC was recorded for flow through the entire packed and undisturbed soil columns. Mass balances showed no losses in total nitrogen as the wastewater percolated through the soil columns. The low COD to nitrogen ratio of the pretreated wastewater and the preferential removal of organics with soil depth restricted the possibility of induced percolation of carbonaceous substrate to the water table for complete denitrification without supplemental organic addition. (Cartmell-East Central Oklahoma State)
W76-01387

COMPARISON OF SOME CALCULATION METHODS FOR RAINWATER RUNOFF (VERGLEICH EINIGER BERECHNUNGSMETHODEN VON REGENWASSERKANALISATIONEN),
For primary bibliographic entry see Field 2A.
W76-01426

THE QUALITY AND TREATMENT OF ARTESIAN WATERS IN HUNGARY (A HAZAI MELYSEGI VIZEK KEZELESENEK SZUKSEGESSEGE ES TECHNOLOGIAJA),
For primary bibliographic entry see Field 5F.
W76-01453

STUDIES ON THE ACTIVITY OF A SODIUM HYPOCHLORITE SOLUTION ON VIBRIO CHOLERAE BIOTYPE ET TOR FOR DRINKING WATER STERILIZATION,
Dakar Univ. (Senegal). Faculty of Medicine and Parmacy.
For primary bibliographic entry see Field 5D.
W76-01465

UPTAKE AND MIGRATION OF TRACERS IN LAKE SEDIMENTS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2H.
W76-01475

A SIMPLE DIFFUSION MODEL OF THE MEAN FIELD DISTRIBUTION OF SOLUBLE MATERIALS IN THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington, (Ontario).
F. M. Boyce, and P. F. Hamblin.
Limnology and Oceanography, Vol 20, No 4, p 511-517, July 1975. 3 fig, 1 tab, 6 ref.

Descriptors: *Diffusion, *Mathematical models, *Lake Erie, *Mixing, Great Lakes, Tracers, Flow, Advection, Chlorides, Distribution patterns, Pollutants, Water pollution, Path of pollutants, Wastes.
Identifiers: *Chloride distribution, Concentrations, Transport.

In cases where the time scale of interest is long compared with the time scales of the principle energy-bearing components of the water motions, the movement of a soluble contaminant may be represented by a simple diffusion equation with a constant effective horizontal diffusion coefficient. A simple steady state model of the concentration field in a lake for a soluble contaminant introduced on the shore was developed and was applied to the distribution of chloride ion in the central basin of Lake Erie, for which appropriate experimental data were available. A horizontal diffusion coefficient, appropriate for basin-wide diffusion phenomena in the Great Lakes and for long-time scales, was estimated from experimental data. (Adams-ISWS)
W76-01476

CLASSIFICATION OF MODELS OF TIDAL WATERS,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2L.
W76-01481

MATHEMATICAL MODEL STUDIES OF WATER QUALITY IN THE POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
L. J. Clark, and K. D. Feigner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-229 797, $7.50 in paper copy, $2.25 in microfiche. Technical Report 33, March 1972. 174 p, 70 fig, 1 tab, 10 ref, append.

Descriptors: *Model studies, *Water quality, *Estuaries, *Potomac River, Mathematical models, Dye releases, Path of pollutants, Effluents, Tidal waters, Tidal effects, Dispersion, Advection.
Identifiers: *Anacostia River.

Mathematical models are becoming an increasingly important 'tool' for predicting, under a variety of conditions, water quality behavior in an estuary. The report presented recent Annapolis Field Office studies on use of models in the Potomac estuary, specifically, the Thomann Model (time-dependent version) and the FWQA Dynamic Estuary Model. Numerous computer runs were made with both models in an attempt to make a reasonably accurate simulation of dye profiles observed in the Potomac estuary following a 13-day continuous release during November 1969 and of observed dye profiles in the Anacostia River following a 7-day continuous release during April 1970. In addition to model verification, consideration was given to: (1) a comparison of modeling approaches, (2) the limitations of each model, (3) input data requirements, and (4) a detailed sensitivity analysis to determine which input parameters had the greatest effect on model output. While mathematical models have been developed for the entire Potomac estuary, most studies in the report pertained to the 40-mile reach of the upper estuary extending from Key Bridge to Sandy Point. (Sims-ISWS)
W76-01497

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA - LAKE ERIE, VOLUME I - SYNTHESIS,
Cleaveland Dept. of Public Utilities, Ohio. Div. of Utilities Engineering.
A. B. Garlauskas.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 353, $6.75 in paper copy, $2.25 in microfiche. Report EPA-905/9-74-005, May 30, 1974. 158 p, 33 fig, 22 tab, 345 ref. EPA G00517.

Descriptors: *Water quality, *Lake Erie, *Baseline studies, Streams, Rivers, Lakes, Fish, Water pollution, Pollution abatement, Pollutant identification, Path of pollutants, Industrial wastes, Cities, Urban runoff, Urban drainage, Pollutants, Water pollution sources, Surveys, Water chemistry, Benthos, Investigations, Sampling, Analysis, Thermal pollution, Model studies.
Identifiers: *Cleaveland(Ohio).

The results of the first phase of a three-phase program in environmental impact assessment, planning, and evaluation in urban water pollution abatement for the Cleveland metropolitan area were presented. The first phase investigated the water quality of near shore waters of Lake Erie in the Cleveland area and of the streams in the same area to establish a baseline to measure the prograss and restorative value of water pollution abatement programs. Seven major investigations were performed dealing with fish population, phytoplankton, zooplankton and benthic organisms, benthic sediment chemistry, water chemistry, cation reactions with suspended river sediments, and hydrodynamic modeling of river and thermal discharge flow into Lake Erie. The field investigations were conducted from September 1971 through December 1972. The area of investigation included lake waters from the mouth of Chagrin River along the shore to the mouth of the Rocky River, 35.5 kilometers. The area included the Cleveland Harbor and lower 20 kilometers of the Cuyahoga River. The study established a rough water quality baseline demonstrating areas of water quality degradation, possible restoration avenues, and need for future research. (Sims-ISWS)
W76-01500

5C. Effects Of Pollution

THE PRAIRIE PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
F. L. Kudrna.
Journal of the Urban Planning and Development Division, American Society of Civil Engineers, Vol 99, No UP2, p 205-215, September 1973. 14 fig, 1 tab.

Descriptors: *Water reuse, *Environmental effects, *Sewage disposal, *Sludge disposal, *Sludge, *Agriculture, Waste water(Pollution), Reclamation, Planning, Watersheds(Basins).
Identifiers: *Urban planning, *Chicago, Urban development.

The Prairie Plan is a conceptual mechanism to recycle urban wastes safely into the natural environment. It assumes that to provide an acceptable solution, the following four requirements must be met: (1) the solution to the problem must be environmentally safe and not transfer the problem to another form of pollution; (2) the solution must be long-term and provide consistently reliable methods of operation; (3) the system must be economically competitive with other alternatives; and (4) the system must maximize multi-use aspects and be both publicly and politically acceptable. The Prairie Plan uses the natural watershed as a planning unit. The Metropolitan Sanitary District of Greater Chicago is implementing the Prairie Plan to recycle wastewater solids over at a 10,500-acre site in Fulton County, Illinois. The multi-use benefits od the Prairie Plan include land reclamation, agriculture, recreation, conservation, wildlife preservation, reforestation, and natural science education. (Bell-Cornell)
W76-01011

PHOSPHORUS IN THE RURAL ECOSYSTEM--RUNOFF FROM AGRICULTURAL LAND,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W76-01017

PHOSPHORUS IN OUR ENVIRONMENT,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5B.
W76-01019

SOIL POLLUTANTS AND THEIR EFFECTS ON CLEAN WATER,
Minnesota Univ., St. Paul. Dept. of Soil Science.
W. P. Martin.
In: Proceedings of Conference on Farm Animal Wastes, Nitrates and Phosphates, in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, February 1-5, 1971, p 125-133.

Descriptors: *Pollutants, *Water pollution, Farm wastes, Soil erosion, Pesticides, Fertilizers, Nutrients, *Soil contamination, Water pollution sources.

Municipal, industrial and agricultural wastes are major causes of pollution and all three must eventually be moderated if the purity of our lakes and rivers is to be restored or maintained. Especially troublesome are agricultural sources: animal wastes, eroded soil, fertilizers, and pesticides. The disposal of organic wastes from farm animals and from other sources related to the farm enterprise has become a major management problem. If land disposal of wastes is to be used, soil type, topography, and land avialability should be carefully considered when locating feedlots and processing operations. Terracing, minimum tillage, and land covers are means of combating soil erosion. Phosphatic fertilizers should be incorporated into the soil, if possible, in order to prevent it from being carried by runoff to surface waters. Measures should be taken to prevent nitrogen in fertilizers and organic wastes from entering surface and groundwater supplies. Pesticides must be realistically evaluated. It is likely that these potentially harmful compounds have benefits that far outweigh their detrimental effects. (Cameron-East Central Oklahoma State)
W76-01020

LIBRARY U. OF I. URBANA-CHAMPAIGN

NATURE AND HISTORY OF THE NITRATE PROBLEM,
Missouri Univ., Columbia, Dept. of Veterinary Medicine and Surgery.
For primary bibliographic entry see Field 5B.
W76-01033

CATTLE FEEDLOT POLLUTION STUDY,
Texas Tech. Univ., Lubbocks. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W76-01045

ROLE OF BACTERIA IN BIOACCUMULATION OF MERCURY IN THE OYSTER CRASSOSTREA VIRGINICA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-01102

CONGENITAL ABNORMALITIES IN METHYLMERCURY POISONING,
New Jersey School of Medicine, Newark. Dept. of Anatomy.
S. H. Gilani.
Environmental Research, Vol 9, p 128-134, 1975. 5 fig, 3 tab, 15 ref.

Descriptors: *Heavy metals, *Mercury, *Pollutants, *Toxicity, *Embryonic growth stage, Deformation, Poisons, Environmental effects, Animal pathology, Incubation.
Identifiers: *Congenital abnormalities, *Chicken embryos, *Methylmercuric chloride, *Teratogenic, *Embryolethal, Malformation, Embryogenesis.

A study is described of the malformation of chicken embryos due to methylmercury poisoning. Methylmercuric chloride was dissolved in sodium bicarbonate (0.2%) and administered to chick embryos at doses ranging from 0.0009 to 0.010 mg per egg. Injections were made into two groups of 420 eggs. Group A received injections on the second day of incubation, while group B received injections on the third day. On the seventh day of incubation, the embryos were examined, treated and stored. Results show that methylmercuric chloride was both teratogenic and embryolethal. Percent survival in group B was higher than group A, but the incidence of gross abnormalities was the same for both groups. Beak defects, exencephaly, shortened and twisted neck, reduced body size, microphthalmia, everted viscera, and hemorrhage all over the body were the major malformations observed. (Davis-Vanderbilt)
W76-01103

IMPACT OF NITRATE FERTILIZER RESTRICTIONS ON SALT RIVER PROJECT AND ROOSEVELT WATER CONSERVATION DISTRICT GROWERS,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
D. F. Schoneman.
Master of Science Thesis, 1974. 130 p, 5 fig, 40 tab, 41 ref.

Descriptors: *Fertilizers, *Crop production, *Arizona, *Nitrates, *Economic impact, Field crops, Water pollution sources, Soil erosion, Soil management, Adoption of practices, Agricultural chemicals, Agriculture, Nitrogen, Farm prices, Regulations.
Identifiers: *Salt River Project District(Ariz), *Roosevelt Water Conservation District(Ariz).

Utilizing a procedure incorporating production functions and a linear programming formulation, the impact of government efforts to control farm pollution by restricting the use of nitrate fertilizers was studied for its effect on growers in the Salt River and Roosevelt Water Conservation areas. Enforcement of strict fertilizer restrictions could reduce the growers net revenue, but restrictions set at recommended agronomic levels could effect increased efficiency by some growers. Limitations of this research are dicussed. (McLachlan-Arizona)
W76-01114

PRELIMINARY INVESTIGATIONS ON MUTUAL GROWTH RELATIONS OF THE POPULATIONS OF THE BLUE-GREEN ALGA MICROCYSTIS AERUGINOSA AND GREEN ALGAE MONORAPHIDIUM MINUTUM AND SCENEDESMUS ABUNDANS IN BICULTURES,
Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej RA.
A. Krzywicka, and D. Krupa.
Acta Hydrobiologica, Vol 17, No 1, p 81-88, 1975. 2 fig, 1 tab, 19 ref.

Descriptors: *Symbiosis, *Reproduction, *Cyanophyta, *Chlorophyta, Cultures, Inhibition.
Identifiers: *Microcystic aeruginosa, *Scenedesmus abundans, *Monoraphidium minutum.

Bicultures of the blue-grass alga Microcystis aeruginosa with common species of green algae were grown under laboratory conditions to determine if there was a relationship between growth of the populations of these two species. During a 16 day biculture, cell numbers of Monoraphidium minutum and Scenedesmus abundans increased much faster than Microcystis aeruginosa. Independent of initial cell numbers of the individual species, proportions changed toward the end of culture in favor of green algae. When the initial proportion of blue-green and green algae was 1:1, the final proportion was 1 Microcystis to 30 Monoraphidium or 1 Microcystis to 22 Scenedesmus. A monoculture control of Microcystis aeruginosa had a larger cell number after 16 days culture than mixed cultures, and there were more reduplications of cell numbers. In bicultures with an initial majority of blue-green algae, the number of reduplications of cell number of both blue-green and green algae was lower than in cultures with other initial proportions, indicating that the generation period of the two species was prolonged. These results suggest that Microcystis blooms in lakes can take place only under conditions unfavorable for green algae. (Buchanan-Davidson--Wisconsin)
W76-01140

SEASONAL VARIATION OF MANGANESE IN A EUTROPHIC LAKE,
Skidmore Coll., Saratoga Springs, N.Y. Dept. of Biology.
H. H. Howard, and S. W. Chisholm.
American Midland Naturalist, Vol 93, No 1, p 188-197, 1975. 2 fig, 29 ref.

Descriptors: *Fluctuations, *Seasonal, *Manganese, Eutrophication, Lakes, New York, Stratification, Turnovers, Surface waters, Hypolimnion, Cycling nutrients, Anaerobic conditions.
Identifiers: *Round Lake(NY).

To understand seasonal manganese availability in a eutrophic lake and determine the influence of stratification and overturn on manganese, Mn concentrations were measured for 15 months in Round Lake, New York. Manganese concentration was 0.014-0.108 ppm in surface waters and 0.042-2.49 ppm in bottom waters. The concentration pattern varied as the lake alternated between overturn and stagnation. Under anaerobic conditions, essentially 100% of manganese passed through a 0.45 micron membrane filter. Winter and summer maximum concentrations were about the same at 1-4 m, but at 5-7 m summer maxima were 2-6 times higher than winter maxima. Epilimnion values decreased 73% immediately after autumn overturn to low values before ice cover. After stratification, manganese concentrations rose in bottom waters until overturn began. Accumulation at 7 m was rapid at first, then slowed. Accumulation in bottom waters was 0.009-0.026 mg/l/day. Assuming values at 1-2 m during summer to be minimal, overturn raised the concentrations for about 6 weeks in spring-summer and 2-3 months in autumn. Blue-green algae were always dominant. Total manganese varied from 174 kg after spring overturn to 2553 kg at end of summer stratification. Possible effects of manganese cycling on organisms and other nutrients are discussed. (Buchanan-Davidson--Wisconsin)
W76-01142

WATER QUALITY AND PHYTOPLANKTON PRODUCTIVITY OF SUMMERSVILLE RESERVOIR,
West Virginia Univ., Morgantown. Dept. of Biology
J. E. Fraser.
Proceedings West Virginia Academy of Science, Vol 8, p 8-16, 1974. 4 fig, 1 tab, 17 ref.

Descriptors: *Water quality, *Phytoplankton, *Primary productivity, *West Virginia, *Reservoirs, Thermal stratification, Epilimnion, Hypolimnion, Oxygen, Hydrogen ion concentration, Light penetration, Conductivity, Alkalinity, Photosynthesis, Carbon, Limiting factors, Aerobic conditions, Mesotrophy.
Identifiers: *Summersville Reservoir(W Va).

Limnological studies of Summersville Reservoir, West Virginia, were conducted from September 1971-October 1972. This seven-year-old reservoir was thermally stratified in summer; the epilimnion was approximately 6 m deep. There was no distinct isothermal hypolimnion. Oxygen was not depleted. The oxygen curve was orthograde in summer but became a clinograde curve after the maximum production peak. Light transmission (1% level) varied from 4-12 m. Conductivity was low. Hydrogen ion concentration ranged from 6.3-7.3, with highest values at the surface. Mean alkalinity was 3.12 mg/l as calcium carbonate. Total inorganic carbon was 1.80-4.92 mg C/l. Carbon fixation ranged from 0.0-842.91 mg C/cu m/day. Aereal production ranged from 3.48-3176.16 mg C/sq m/day; total annual areal production was 170.11 g C/sq m. There was a small spring phytoplankton production peak with maximum production of 217.60, and a summer peak with 842.91 mg C/cu m/day. On high productivity days, the vertical assimilation curve had an epilimnic assimilation maximum followed by a rapid decline. On sunny summer days with high transparency, the curve had both epilimnic and metalimnic maxima. Algal growth was more light-limited than nutrient limited. The lake is considered mesotrophic. (Buchanan-Davidson--Wisconsin)
W76-01143

PHOSPHORUS IN SURFACE RUNOFF FROM A DECIDUOUS FOREST,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W76-01145

NITRATE, PHOSPHORUS, AND SULFATE IN SUBSURFACE DRAINAGE WATER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-01146

AN EVALUATION OF ARTIFICIAL DESTRATIFICATION FOR CONTROL OF ALGAL BLOOMS,
Tetra Tech, Inc., Lafayette, Calif.
M. W. Lorenzen, and R. Mitchell.
Journal American Water Works Association, Vol 67, No 7, p 373-376, 1975. 7 fig, 1 tab, 12 ref.

Descriptors: *Destratification, *Probability, *Water quality control, *Mathematical models, *Algal control, Limiting factors, Light penetration, New Hampshire, Forecasting, Mathematical models.
Identifiers: Kezar Lake(NH).

To evaluate the suitability of a lake for artificial destratification for control of algal blooms, a diagram plotting peak algal biomass as a function of mixed depth for both nutrient and light limitations is needed. Studies of eutrophic Kezar Lake, New Hampshire, which was destratified in 1968, 1969, and 1970 with compressed air, were used to evaluate a model developed to predict effects of artificial destratification on algal production in impoundments. The model considered both nutrient depletion and light limitation as potential biomass limiting factors. These were combined to determine the upper limit to biomass production as a function of mixed depth. Nutrient limitation was the capacity to produce biomass before some essential nutrients were exhausted. Biomass limitation by available light was determined by evaluating the balance between photosynthesis and respiration in the water column. Artificial destratification did not increase algal biomass and total peak biomass was lower during continuous aeration. Because total biomass was reduced when the mixed layer depth was increased, algal cell concentration was reduced. Apparently the algae were unable to use available nutrients when artificially mixed. Results suggested that available light limited peak biomass. (Buchanan-Davidson--Wisconsin)
W76-01147

USE OF WATERHYACINTHS TO REMOVE NITROGEN AND PHOSPHORUS FROM EUTROPHIC WATERS,
Louisiana Agricultural Experiment Station, Baton Rouge.
E. P. Dunigan, R. A. Phelan, and Z. H. Shamsuddin.
Hyacinth Control Journal, Vol 13, June, p 59-61, 1975. 2 fig, 1 tab, 12 ref.

Descriptors: *Nutrient removal, *Water hyacinth, Aquatic plants, Nitrogen compounds, Phosphorus compounds, Ponds, On-site tests, Louisiana, Laboratory tests.

Water hyacinths were grown in the greenhouse in six liters of water containing either 0.3 g (50 ppm), 0.6 g (100 ppm), or 1.5 g (250 ppm) nitrogen or phosphorus as ammonium chloride-nitrogen, potassium nitrate-nitrogen, or potassium hydrogen phosphate-phosphorus. Ammonium-nitrogen (50 or 100 ppm) was completely gone in 15 and 21 days; nitrate-nitrogen (50 ppm) was removed in 23 days. Large losses of ammonium-nitrogen and nitrate-nitrogen also occurred within 35 days at the higher concentrations. About 80, 150, and 210 mg of phosphate-phophorus were removed from water containing 50, 100, and 250 ppm phosphorus. At the highest level, phosphorus was apparently released to the water during the first three weeks of the experiment. Field studies were conducted at two farm ponds near Baton Rouge and St. Gabriel, Louisiana, using bottomless barrels set in pond sediment. The tests indicated that water hyacinths increased the rate at which ammonium-nitrogen was lost from pond waters. They were completely ineffective in reducing nitrate-nitrogen and of minimal value in phosphate-phosphorus losses. Observed nitrate and phosphate concentrations decreases were due to denitrification, adsorption, and other mechanisms. (Buchanan-Davidson--Wisconsin)
W76-01148

LIGHT, NITROGEN, AND PHOSPHORUS LIMITATION OF EDAPHIC ALGAE IN A DELAWARE SALT MARSH,
Rook Coll., New Brunswick, N. J. Dept. of Entomology and Economic Zoology.
M. J. Sullivan, and F. C. Daiber.
Journal of Experimental Marine Biology and Ecology, Vol 18, p 79-88, 1975. 3 tab, 13 ref.

Descriptors: *Benthic flora, *Limiting factors, *Algae, *Salt marshes, *Light intensity, Nitrogen, Phosphorus, Delaware, Tidal effects, Productivity, Standing crops, Cycles, Chlorophyll, Diatoms.
Identifiers: Canary Creek(Dela.), Spartina alterniflora, Delaware Estuary.

The environmental factors which regulate the production and species composition of the edaphic algal standing crop during the yearly cycle, the effects of changing light intensity and adding inorganic nitrogen and phosphorus as fertilizer to the surface of the Canary Creek salt marsh, Lewes, Delaware, were studied on algae associated with a pure stand of cord grass, Spartina alterniflora. The standing crop of edaphic algae, measured by chlorophyll-a production, was limited by phosphorus during the fall and winter, by both phosphorus and nitrogen in the spring, and only by nitrogen in the summer. Responses were in phase with seasonal fluctuations of phosphorus and nitrogen, thus it is concluded that the flood tide was the major source of nitrogen and phosphorus compounds for the algal growth. Reduction in the amount of light reaching the algae because of the Spartina cover was always a limiting factor for the standing crop. A gradient in algal flora composition was directly related to light intensity, and indicated that light intensity determined the relative contribution of diatoms and filamentous algae to the community. In the Delaware salt marshes and further north, only the algal component remains functional throughout a yearly cycle and a significant portion of its production is at a time when the grasses are dormant. (Buchanan-Davidson--Wisconsin)
W76-01149

ALGAE OF DAM RESERVOIRS IN THE SOLA CASCADE AND NEIGHBOURING SECTORS OF THE RIVER,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
K. Kyselowa, and L. Krzeczkowska-Woloszyn.
Acta Hydrobiologica, Vol 16, No 3-4, p 401-416, 1974. 4 fig, 3 tab, 15 ref.

Descriptors: *Algae, *Reservoirs, *Seston, *Periphyton, Rivers, Eutrophication, Self-purification, Sphaerotilus, Aquatic bacteria, Diatoms, Cyanophyta, Dominant organisms, Water pollution effects, Chrysophyta, Plankton, Euglenophyta, Europe.
Identifiers: Cascade reservoirs, Sola River(Poland), Porabka Reservoir(Poland), Tresna Reservoir(Poland), Czaniec Reservoir(Poland).

The influence of damming the Sola River, Poland, on seston and periphyton communities of the river and plankton of the reservoirs was studied. Above the Tresna Reservoir, Sphaerotilus natans, other bacteria, and colorless flagellata were observed on the left bank, and diatoms and blue-green algae on the right bank. These differences may have been due to sewage inflow. The periphyton and seston indicated pollution in this area. Below the dam a few Sphaerotilus natans were observed and the periphyton composition indicated less pollution. In the three reservoirs Chrysophyceae were dominant in May, Bacilariophyceae in July and September, and algal numbers decreased in September. Algal numbers in the cascade did not change, but there was uneven development of certain algae, suggesting a decrease in eutrophication; however the types of algae were characteristic for waters with organic pollution. Water above the reservoir was more polluted than that below, indicating the influence of reservoirs on river purity. Dam reservoirs created favorable conditions for development of planktonic algae which are important in self-purification. Planktonic species developing in these reservoirs were found in sestion below the reservoirs. Diatoms originating in the river were observed in the reservoir plankton. (Buchanan-Davidson--Wisconsin)
W76-01150

NUTRIENTS AND ALGAE IN SOME CENTRAL IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
S. P. Kilkus, J. D. LaPerriere, and R. W. Bachmann.
Journal Water Pollution Control Federation, Vol 47, No 7, p 1870-1879, 1975. 8 fig, 2 tab, 25 ref.

Descriptors: *Euthrophication, *Nutrients, *Algae, *Streams, Rivers, Iowa, Streamflow, Water pollution sources, Phosphorus compounds, Nitrogen compounds, Diatoms, Mathematical studies.

Suspended algae and plant nutrients were measured in streams near Ames, Iowa. Nutrient levels were high averaging, 0.16 mg/l orthophosphate phosphorus, 0.54 mg/l ammonia nitrogen, and 1.75 mg/l nitrate nitrogen. Correlations between phosphate, ammonia nitrogen, and nitrate nitrogen and adjusted flows were significant and positive; correlations between human population densities and ammonia nitrogen and nitrate nitrogen were not. A significant correlation with orthophosphate phosphorus and human population was found, however, but phosphorus sources unrelated to urban density were of greater importance. Concentrations of phosphate nitrate, and ammonia increased with increase in flow. Removal of phosphorus from wastewater effluents through tertiary treatment would have little effect on nutrient concentrations. Logarithmic average mean algal populations were 54.7 mg chlorophyll-a/cu m and 24,500 cells/ml. Diatoms were dominant, followed by Scenedesmus and Oscillatoria. The larger the watershed, the higher the average chlorophyll-a concentration. High algal chlorophyll levels were associated with low flow periods. Algal carbon-14 uptake was not stimulated when phosphorus or nitrogen were added. Algae did not reduce phosphorus and nitrogen to limiting levels during flow; volume of flow, drainage area, and temperature were associated with 50% of chlorophyll-a variance. (Buchanan-Davidson--Wisconsin).
W76-01152

A STUDY OF THE BENTHIC ALGAE IN THE KELP BED OFF DEL MONTE BEACH, MONTEREY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
J. L. Keithly.
Available from the National Technical Information Service, Springfield Va 22161 as AD/A-005 465. MS thesis, December 1974. 143 p, 17 fig, 7 tab, 22 ref, 5 append.

Descriptors: *Marine algae, *Benthic flora, *Kelps, Coasts, California, Varieties, Periphyton, Distribution patterns, Surveys, Mapping.
Identifiers: *Del Monte Beach(Calif), *Monterey(Calif).

Approximately 50 benthic algal species and one eel grass specie were collected and identified. When 13 of the most abundant and/or easily recognized genera were classified into five floral groups according to taxonomy and height and mapped if they were found in pre-selected quadrat sites, abundance of each genera group was less in large sand covered shale areas, greater near shale ledge edge areas, and dependent on genera grouping when within Macrocystis 'hold-fast near field areas.' The mean number of stipes counted per holdfast decreased between winter and summer collections. Aerial photography over a five year period revealed that the kelp canopy showed a substantial size increase between October 1971-December 1972. Kelp beds near the city of Monterey sewer outfall appeared to be receding into deeper water from October 1971-January 1974. Theoretical wave refraction energy computations appeared consistent with the presence of Zostera

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and the best developed Cystoseira and Dictyoneuropsis in predicted calm water areas, as well as presence of Nereocystis and Pterygophora in predicted high wave energy areas. A species list and their ecological distribution is appended. (Buchanan-Davidson--Wisconsin)
W76-01153

SODIUM: A FACTOR IN GROWTH OF BLUE-GREEN ALGAE,
Michigan State Univ., East Lansing. Dept. of Botany.
A. K. Ward.
Available from the National Technical Information Service Springfield, Va 22161 as COO 1599 84, $4.00 in paper copy, $2.25 in microfiche. MS thesis, 1974. 48 p, 11 fig, 2 tab, 38 ref. AEC AT-(11-1)-1599, COO-1599-84.

Descriptors: *Algae, *Cyanophyta, *Sodium, *Inhibition, Growth rates, Anabaena, Nitrates, Nitrogen, Carbon, Metabolism, Laboratory tests, Nitrogen fixation, Sodium chloride, Photosynthesis, On-site tests, Michigan, Limiting factors.
Identifiers: Anabaena cylindrica, Organic carbon excretion, Wintergreen Lake(Mich).

Response of axenic cultures of Anabaena cylindrica to sodium and nitrate was examined, with special emphasis on aspects of nitrogen and carbon metabolism. In situ sodium enrichment bioassays were employed to ascertain response of natural populations of heterocystous blue-green algae to sodium additions. Acetylene reduction was used to compare nitrogen-fixing ability of blue-green algae. Assimilation of inorganic radioactive carbon was used to determine photosynthetic carbon fixation rates. With no added sodium chloride, cultures showed decreased acetylene reduction, C14 assimilation, organic carbon excretion, chlorophyll-a, and particulate organic carbon compared to cultures with added sodium. Sodium deficient cultures released more previously fixed carbon as organic carbon. No differences were demonstrated with higher sodium concentrations. High nitrate concentrations caused decreased rates of acetylene reduction and heterocyst numbers in sodium sufficient and sodium deficient cultures; decreased particulate organic nitrogen content at high nitrate levels occurred only in sodium deficient cultures. Higher percentages of excreted organic carbon occurred with increasing nitrate concentrations in sodium deficient cultures. Sodium enrichment bioassays in Wintergreen Lake, Michigan, indicated increased photosynthetic carbon fixation with small additions of sodium but higher concentrations had no effect. No increase in in situ acetylene reduction rates occurred among natural populations with added sodium. (Buchanan-Davidson--Wisconsin)
W76-01156

PHYTOPLANKTON COMPOSITION OF A SMALL SUBARCTIC LAKE IN THE NORTHWEST TERRITORIES, CANADA,
Toronto Univ. (Ontario). Dept. of Botany.
R. Sheath, and M. Munawar.
Phycologia, Vol 13, No 2, p 149-161, 1974. 3 fig, 2 plates, 1 tab, 61 ref.

Descriptors: *Biological communities, *Phytoplankton, *Subarctic, *Lakes, Canada, Varieties, Speciation, Diatoms, Chlorophyta, Cyanophyta, Dinoflagellates, Euglena, Chrysophyta, Plant morphology, Pyrrophyta, Nannonplankton, Trophic level.
Identifiers: *Hanna Lake(Canada), Norman Wells(Northwest Territories).

A qualitative survey of phytoplankton is subarctic Hanna Lake, near Norman Wells, Northwest Territories, showed that during the ice-free period, there were 81 common taxa. Major groups accounting for 83.9% of the total species were Diatomeae, Chlorophyta, and Cyanophyta. Chrysomonads, cryptomonads, Heterokontae, and dinoflagellates comprised 16% of the species. There were no Euglenophyta. Dominating morphological forms were nonmotile unicells and colonies; 12% were phytoflagellates and 14% filamentous. Comparisons with other subarctic and arctic lakes indicated that diversity of taxonomic groups and morphological forms was not restricted by increasing latitudes. Nanoplankton species outnumbered net plankton. Of the net plankton, 62% were filamentous blue-green algae and diatoms. Of the nanoplankton, the largest group was the 21-40 micrometer size. The only ultraplankton was Erkenia subaequiciliata. Phytoplankton quotients were: Myxophycean 3.2, Chlorophycean 2.5, diatom 0, and compound 5.7; except for the diatom quotient, these were in the range for eutrophic lakes. Algal species numbers were very ephemeral. Concurrent with a decrease in diatom numbers, a rapid increase in species numbers (primarily Chlorophyta and Cyanophyta) occurred during the summer. Eutrophic conditions appeared to occur naturally in this lake, as shown by nutrient levels, species composition, phytoplankton quotients, and ration of net plankton/nanoplankton. (Buchanan-Davidson--Wisconsin)
W76-01157

THE RAPID QUANTITATION OF THE FILAMENTOUS BLUE-GREEN ALGA PLECTONEMA BORYANUM BY THE LUCIFERASE ASSAY FOR ATP,
Delaware State Coll., Dover. Dept. of Biology.
V. H. Bush.
Available from the National Technical Information Service, Springfield, Va 22161, as N74 33527, $3.50 in paper copy, $2.25 in microfiche. Report 1974. 20 p, 4 fig, 4 tab, 7 ref. NASA 08002-003.

Descriptors: *Analytical techniques, *Biomass, *Algae, Cyanophyta, Measurement, Population, Assay.
Identifiers: *Luciferase, Plectonema boryanum, Adenosine triphosphate.

Microscopic cell counts, luciferase assay for ATP, and optical density measurements were used to quantitatively measure populations of Plectonema boryanum, a filamentous blue-green alga. Disruption of the gelatinous sheath without disrupting the cells is a prerequisite for accurate cell counting, but various physical and chemical means (ultrasonic sound, heat, freezing, nitric acid, pineapple juice, sodium hydroxide, Triton X-100) were unsuccessful. When five-day-old cultures of P. boryanum were diluted with growth medium, there was a linear relationship between the three methods and algal population but the luciferase method for determining ATP was the most rapid and accurate. ATP was determined by extracting tle cells with 2N nitric acid, and amount of extractable ATP measured by the bioluminescent firefly luciferase reaction. This study was limited to P. boryanum of a given age and grown under specified conditions. (Buchanan-Davidson--Wisconsin)
W76-01158

CHEMICAL AND MICROBIOLOGICAL STUDIES OF THE MIDDLE SALT LAGOON, BARROW, ALASKA,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
W. L. Boyd, and J. W. Boyd.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-001 229, $4.00 in paper copy, $2.25 in microfiche. Final Report September 1974. 45 p, 5 fig, 14 tab, 19 ref. ONR NOOO14-67A-0299-0015.

Descriptors: *Saline lakes, *Chemical properties, *Arctic, *Biota, Alaska, Bacteria, Sewage effluents, Optical properties, Lagoons, Runoff, Bottom sediments, Halophytes.
Identifiers: Middle Salt Lagoon(Alaska), Barrow(Alaska).

The ecology of a salt lagoon, adjacent to Chukch Sea, was studied in 1971 1972 before installatio of a sewage treatment plant. The lagoon was use as a depository for sewage from the Naval Arcti Research Laboratory. Although it seemed like a ideal component of a two cell disposal system with concentration during winter and dilution int the sea in summer, this was not the case. Littl sludge flushed out of the main basin during runoff Runoff and melt water flowed over denser layers probably resulting in a greater dilution after th sea channel had been closed. A slow turnover rat of soluble bottom material occurred for 2- months. Phosphorus concentration was low excep at the sewage outfall and there was no evidence o eutrophication despite the use of detergents. Am monianitrogen was high, but nitrate- and nitrite nitrogen were only found occassionally in shallow areas. Pollution indicator organisms were low, ex cept in bottom sediments because of the outfal design. Marine and halophilic bacteria were sig nificant during the ice-free period. The lagoon ha no odor and was clear except near the bottom Most of the microbial populations were associate with bottom sediments. (Buchanan-Davidson--Wisconsin)
W76-01159

BLOOMS OF SURF-ZONE DIATOMS ALONG THE COAST OF THE OLYMPIC PENINSULA WASHGINTON. V. ENVIRONMENTAL CONDITIONS ASSOCIATED WITH THE BLOOMS (1971 AND 1972),
Washington Univ., Seattle. Dept. of Oceanography.
J. Lewin, T. Hruby, and D. Mackas.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 229-241, 1975. 7 fig, 1 plate, 15 ref. NSF GA 27498, AEC AT(45-1) 2225, TA26.

Descriptors: *Ecological distribution, *Marine algae, *Diatoms, *Surf, Washington, Pacific Coast Region, Coasts, Phosphates, Salinity, Water temperature, Nutrients, Nitrates, Silicates, Diurnal distribution, Ammonia.
Identifiers: Surf diatoms, Copalis Beach(Wash.), Chaetoceros armatum, Asterionella socialis, Biddulphia aurita, Olympic Peninsula(Wash.).

Environmental conditions associated with heavy diatom blooms in 1971-2 at Copalis Beach, Washington, were monitored. Chaetoceros armatum was always present; Asterionella socialis disappeared in late summer and autumn of 1972 when there was upwelling of oceanic water. Biddulphia aurita (of minor importance in blooms) was present in late winter and spring. These species are physiologically adaptable and are able to tolerate and grow in widely fluctuating temperatures, salinity, light, and nutrient levels. During April, salinity was low, silicate high, and nitrate decreased due to mixing of ocean and river waters which were both low in nitrate. Duration of nitrate depletion depended on intensity of deep oceanic water upwelling (influenced by magnitude and duration of northerly winds and river runoff) Populations did not become significantly nutrient-limited; while nitrates were low ammonium was present. C. armatum nitrate reductase was low when nitrate was absent in summer. Length of A. socialis disappearance depended on magnitude of upwelling, possibly caused by increase in salinity. (Buchanan-Davison--Wisconsin)
W76-01160

WATER POLLUTION FROM AGRICULTURE,
Kungliga Lantbrukshogskolan, Uppsala (Sweden).
For primary bibliographic entry see Field 5B.
W76-01162

MEASUREMENT OF ZOOPLANKTON BIOMASS BY CARBON ANALYSIS FOR APPLICATION IN SOUND SCATTERING MODELS,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5A.
W76-01163

RELIMINARY LABORATORY RESEARCH IN XPERIMENTAL BRACKISH ECOSYSTEMS,
C. Lacaze, C. Hallopeau, and M. Voight.
vailable from the National Technical Informa-on Service, Springfield, Va 22161 as PB-237 796- $3.50 in paper copy, $2.25 in microfiche. EPA-R 58-75, 1974. 15 p, 3 fig, 32 ref. Translated from ulletin du Museum National d'Histoire Na-relle, Series 2, Vol 41, No 5, p 1278-1289, 1969.

escriptors: *Water pollution effects, *Brackish ater, *Laboratory tests, *Ecosystems, Europe, quatic animals, Aquatic plants, Diatoms, Biolog-al communities, Periphyton.
entifiers: France.

rackish ecosystems for water pollution biassay ere established in tanks filled with diluted sea ater, kept at 19C, lighted for 12 hours, and eated with sediment and biocenoses from the Ar-chon Basin ponds, France. Plant material con-sted of Chaetomorpha lineum and Cladophora rriendii, which sheltered abundant fauna. Dur-g the year Spirulina subsalsa repeatedly bloomed d some Chaetomorpha decayed. After a year pirulina subsales, Oscillatoria chalybea, Lyngbya tea, Ulvella, Exuviella, and diatoms were tablished. Much of the microflora epiphytes of haetomorpha and Cladophora disappeared and a w characteristic macroflora developed. Another atom community was established in the Spirulina atting which was rich in organic matter from haetomorpha decomposition. There were acrofauna and microfauna. All macrofauna spe-es brought with the algae were supported, but ult forms seemed less numerous than young rms and some species underwent a dramatic velopment, e.g., Sagartia. During the first three onths numerous species disappeared. Spirulae used alternating periods of growth and generation, with the variations in algal develop-ent and phosphate concentrations synchronized. ter four months, the periphyton was more diver-ied and persistent and Spirulina developed, es-ntially destroying Chaetomorpha and adophora. A characteristic flora established it-lf in the spirulae mollusks. (Buchanan-David-n-Wisconsin)
76-01165

UTRIENT AND PHYTOPLANKTON STUDIES F LLANGORSE LAKE, A EUTROPHIC LAKE THE BRECON BEACONS NATIONAL PARK, ALES,
ent Univ., Peterborough (Ontario). Dept. of ology.
Jones, and K. Benson-Evans.
eld Studies, Vol 4, No 1, p 61-75, 1974. 8 fig, 5 , 19 ref.

scriptors: *Nutrients, *Phytoplankton, utrophication, Lakes, Water temperature, Eu-pe, Silica, Diatoms, Phosphates, Hard-ss(Water), Nitrites, Growth rates, Period of owth, Varieties, Cyanophyta, Chlorophyta, mporal distribution, Ammonia, Calcium, Mag-sium.
entifiers: *Llangorse Lake(Wales), Myx-hyceae.

nsiderable recreational stress is placed on this e due to its proximity to large industrial areas of uth Wales and the Midlands. Data collected in 61-1962 and in 1966-1967 concerning nutrients d phytoplankton are compared. This shallow e is almost homothermal. The pH increases in mmer and early autumn. Nutrient levels in the lowing river, Afon Llynfi, remained relatively astant except during high volume in winter. Sil-concentration rose to a maximum in late mmer and autumn, but winter diatoms caused pletion. Phosphate was high in early summer d low in winter; the phosphate level had in-ased between 1961 and 1966. Total hardness s constant except when diluted by winter rains. rites reached a peak in early summer and in ly winter in Afon Llynfi. Maximum phytoplankton growth was associated with high lake water temperatures and macronutrient concentrations. Periodicity in major phytoplankton species is detailed. The winter burst of diatoms was followed by a spring increase of green algae. Increasing lake water temperatures and hydrogen ion concentrations in late summer were associated with increases in Cyanophyta. Microcystis flos-aquae blooms were noted in both years, but the bloom was twice as high in 1966 as in 1961. Species of phytoplankton, epiphytes, and epiliths are given. (Buchanan-Davidson--Wisconsin)
W76-01167

COMMUNITIES OF THE PERIPHYTON ALGAE OF CHANNEL LAKES OF BYSZEWO,
Nicolas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plant Geography.
M. Luscinska.
Acta Universitatis Nicolai Copernici, Limnological Paper No 8, p 35-45, 1974. 5 fig, 3 tab, 4 ref.

Descriptors: *Biological communities, *Periphyton, *Aquatic algae, Water quality, Lakes, Systematics, Mesotrophy, Spring, Diatoms, Chlorophyta, Hardness(Water), Summer, Littoral, Calcium.
Identifiers: *Byszewo lakes(Poland).

One hundred and fifty one periphyton taxa were found in the littoral zone of 10 channel lakes of Byszewo, Poland, of which 32 were planktonic or benthic. Most of the components of these communities were diatoms and adhered to the larger algae of the upper layers; others were attached to substrata. The second largest group was the Chlorophyceae, most of the them belonging to the Chaetophorales. Most of the taxa were characteristic of the periphyton of eutrophic lakes. Periphyton collected in May from young reeds and those growing from last year's reeds showed only slight differences. In September some filamentous algae were found which were not found in May. The association of Oedogonio-Epithemietum litoralae indicated the high purity of the littoral waters. This association is characteristic of eutrophic lakes rich in calcium but unpolluted with other nutrients and organic substances. (Buchanan-Davidson--Wisconsin).
W76-01168

PHOSPHORUS IN NEW YORK STATE RIVERS: SOURCES, SINKS, AND DETERGENTS,
State Univ. of New York at Binghamton. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-01170

PHYTOPLANKTON SUCCESSIONS AND SPECIES DISTRIBUTION IN PRAIRIE PONDS OF THE ERICKSON-ELPHINSTONE DISTRICT, SOUTHWESTERN MANITOBA,

H. Kling.
Canada Department of the Environment, Fisheries and Marine Service Technical Report No 512, 1975. 33 p, 5 fig, 2 tab, 28 ref.

Descriptors: *Phytoplankton, *Succession, *Varieties, *Distribution, *Potholes, Lakes, Canada, Trophic level, Euthrophication, Biomass, Dominant organisms.
Identifiers: Erickson-Elphinstone(Manitoba).

Phytoplankton of 50 small prairie pothole lakes in the Erickson-Elphinstone region of Manitoba have been surveyed since 1972. Seasonal succession studies were conducted in five lakes in 1973. These lakes are very eutrophic with midsummer maximum biomass values above 10,000 mg/cu m. The phytoplankton were mainly Cyanophyta. Peridinae became dominant in a few lakes during certain years, although they were usually of minor importance. When dominant, Ceratium hirundinella was the only species present. A total of 237 taxa were identified in these lakes from 1972-1974. It would appear that the more eutrophic the lake, the fewer species were present. Spring and fall samples generally contained more species than summer and winter samples. These lakes could be generally classified as having mesotrophic or eutrophic dinoflagellate plankton, eutrophic chloroccal plankton, and cyanophycean plankton. When the lakes were compared on the basis of their summer maximum biomass and predominance of various algal groups, there was increased predominance of Cyanophyta of Chlorophyta as the lakes became more eutrophic (indicated by areas which increased biomass). Those with lower biomass values and nutrients showed a predominance of Chrysophyceae. The Erickson-Elphinstone lakes are highly eutrophic with high summer maximum biomass values and high Cyanophyta dominance. (Buchanan-Davidson-Wisconsin)
W76-01171

CHANGE IN PLANKTONIC COMPLEXES IN THE EUTROPHIC LAKE BALTYM DUE TO OVERGROWTH BY WEED,
Ural and Siberian Fishery Scientific-Research and Planning Inst. Sverdlovsk (USSR).
I. V. Kozlova.
UDC 577.472(26). Translated from Ekologiya, No 4, p 104-107, 1973. Published by Consultants Bureau, Div. of Plenum Publishing Corp, New York City. 1 tab, 5 ref.

Descriptors: *Eutrophication, *Aquatic weeds, *Phytoplankton, *Zooplankton, Rotifers, Daphnia, Biological communities, Cyanophyta, Chlorophyta, Biomass, Chrysophyta, Crustaceans, Nostoc, Fish.
Identifiers: *Lake Baltym(USSR).

Changes in species composition and zooplankton development in relation to aquatic vegetation overgrowth in Lake Baltym, USSR, are discussed. Before 1950, there was little overgrowth; in 1952, aquatic vegetation spread and by 1962 occupied almost 50% of the bottom. Eutrophication occurred due to shoreline developments and absence of seine netting. Hornwort beds covered the center and some parts were solid masses of elodea, milfoil, and pondweed. In 1962 a blue-green and green algae bloom occurred. Daphnia and Mesocyclops oithonoides disappeared, and Eudiaptomus graciloides, Mesocyclops leuckarti, Bosmina mixta, Ceriodaphnia pulchella, and C. quadrangula increased. Macrophytes spread caused changes in phyto- and zooplankton communities. Blue-green algae and chrysophytes bloomed in 1965. In 1970 aquatic vegetation covered most of the lake bottom. Hornwort and Elodea were most abundant. The lake 'bloomed' with green algae, chrysophytes, and blue-green algae. Elodea, milfoil, pondweed, reeds, Nostoc, Bosmina longirostris, Ceriodaphnia pulchella, and Mesocyclops leuckarti attained high density. Eudiaptomus graciloides was low. Rotifers constituted 49.5% of total biomass. Zooplankton were low in 1970. Reduction of crustaceans indicated deteriorating growth conditions. Restoration of the planktonic food base will necessitate removal of vegetation (which suppressed many pelagic zooplankton) by stocking with phytophagous fish, Ctenopharyngodon idella and Hypophthalmichthys molitrix. (Buchanan-Davidson--Wisconsin)
W76-01172

THE ALGAE OF SALINE AREAS NEAR VLISSINGEN (THE NETHERLANDS),
Leiden Rijksherbarium (Netherlands).
P. J. G. Polderman.
Acta Botanica Neerlandica, Vol 23, No 2, p 65-79, 1974. 5 fig, 1 tab, 27 ref.

Descriptors: *Algae, *Brackish water, *Saline water, *Vegetation, Saline water intrusion, Dominant organisms, Period of growth, Biological communities, Distribution patterns, Varieties, Systematics, Europe.

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Identifiers: Vlissingen(Netherlands), Puccinellietum fasciculatae, Juncetum gerardii, Vaucheria.

Composition and periodicity of algal mats in saline seepage areas on the landward side of dikes near Vlissingen, The Netherlands, are described. Puccinellietum fasciculatae was the predominant higher plant in areas higher in salinity than those inhabited by Juncetum gerardii. Rhizoclonium riparium was usually the most important algae, but was occasionally replaced by Vaucheria. Blue-green algae, Nodularia harveyana and Schizothrix calcicola, were always present. Some periodicity in growth of green algae, Ulothrix subflaccida and U. pseudoflacca, was observed. Algal cover often decreased at the end of May. Substrate, water regime, higher plant density, desiccation, and mode of growth influenced algal cover. Rhizoclonium grew better in summer and autumn and Ulothrix peaked in winter. Apistonema were the only algae found in salt crusts in summer. Differences in algal species composition in Juncetum gerardii and Puccinellietum fasciculatae were small. Plots could be distinguished by the Vaucheria species present. In saline areas of North Holland, only Juncetum gerardii was found. Ecological boundaries of algal species were different from those of higher plants. Classification of algae in saline environments must be based on investigations of large areas with diverse terrain made each season for several years. (Buchanan-Davidson--Wisconsin)
W76-01173

SOME CARPATHIAN RESERVOIRS AND THEIR PRODUCTION RELATIONS,
Polish Academy of Sciences, Krakow (Poland). Zaklad Biologii Wod.
M. Bombowna, and H. Bucka.
Acta Hydrobiologica, Vol 16, No. 3-4, 1974. p 379-400, 11 fig, 4 tab, 14 ref.

Descriptors: *Reservoirs, *Productivity, Chemical properties, Phytoplankton, Primary productivity, Chlorophyll, Diatoms, Chrysophyta, Chlorophyta, Dominant organisms, Nutrients, Europe, Watersheds(Basins), Phosphates, Waste water(Pollution), Biomass, Photosynthesis, Algae, Trophic level.
Identifiers: Sola cascade reservoirs(Poland), Vistula River(Poland).

Chemical relations, phytoplankton primary production, and chlorophyll content in two reservoirs of the Sola cascade and a lowland reservoir at Goczolkowice, Poland, were compared, to determine if production depended on chemical composition of water or reservoir type. Diatoms dominated the algal communities; Cyclotella comta and Cryptomonas erosa were present in all reservoirs and Chrysococcus in Goczalkowice. Green algae increased at the end of summer with Nephrochlamys Willeana in all reservoirs and Raphidonema longiseta and Dictyosphaerium pulchellum at Tresna and Porabka. Fertility depended on nutrient inflow from the catchment areas. Sufficient phosphates were present even in summer due to municipal waste inflows. Asterionella formosa appeared at the beginning of summer. Morphometric features did not significantly influence production in Tresna and Goczalkowice reservoirs. Chlorophyll-a concentration could be positively correlated with production and nutrient content. Phytoplankton renewal time was a good indication of photosynthetic activity. Decrease in productivity down the cascade and increase in algae characteristic of clean water at Porabka indicated a favorable response to a system of reservoirs on a river. Eutrophication was moderate, but greater in the Tresna reservoir due to a short filling period and sewage inflow from Zywiec causing less production stability than in the Goczalkowice reservoir.
W76-01175

HEAVY-METAL TOLERANCE IN ALGAE FROM CONTAMINATED LAKES NEAR SUDBURY, ONTARIO,
Toronto Univ. (Ontario). Dept. of Botany.
P. M. Stokes, T. C. Hutchinson, and K. Krauter.
Can J Bot. Vol 51, No 11, p 2155-2168. 1973.
Identifiers: *Algae, *Bioassay, *Canada(Sudburg), Chlorella-Fusca-Var-Vacuolata, *Heavy metals, Copper, EDTA, Lakes, Nickel, Nutrients, Scenedesmus-Acutiformis-Var-Alternan, Hydrogen ion concentration.

Chemical analyses of lake waters in the Sudbury (Canada) smelting area indicated abnormally high levels of metals, especially of Cu and Ni. Two of the algal isolates from these contaminated lakes, Scenedesmus (acutiformis var. alternans) and Chlorella (fusca var vacuolata), were chosen for study. Their growth, as determined by cell number, was tested under controlled conditions in defined media. Nutrient conditions, pH, and concentration in solution Cu and Ni were used as variables in bioassays. In comparison with laboratory strains of similar algae, in medium with no chelate (EDTA) the isolated lake strains were found to be tolerant of the heavy metals N (Scenedesmus) and Cu (Scenedesmus and Chlorella). The patterns of response to metals in solution differed markedly between laboratory and lake strains. The ecological implications are considered.--Copyright 1974, Biological Abstracts, Inc.
W76-01197

STUDIES ON THE DECOMPOSITION OF A DUCKWEED (LAMNACEAE) COMMUNITY,
Allegheny Coll., Meadville, Pa. Dept. of Biology.
H. R. Laube, and J. R. Wohler.
Bull Torrey Bot Club. Vol 100, No 4, p 238-240. 1973. Illus.
Identifiers: *Decomposition, Dry matter, *Duckweed, Lemna-Minor, Lemna-Trisulca, Lemnaceae, Magnesium, Manganese, *Pennsylvania, Sodium, Spirodela-Polyrrhize, Temperature, Wolffia-Columbiana, Ponds.

During the late summer and fall of 1971 and 1972, decomposition of even-dried duckweeds (Spirodela polyrhize, Lemna minor, L. trisulca, and, in late summer, Wolffia columbiana) returned to a small pond in northwestern Pennsylvania was monitored and samples analyzed for the loss of dry weight, organic weight, inorganic weight, M, Mn and Na. A laboratory study also performed to measure loss of the above at 10 C and 20 C. Results of these studies indicate that within one week, at least 20% of the dry matter is lost and that over 50% of the M, Mn and Na are lost within 3 weeks.--Copyright 1974, Biological Abstracts, Inc.
W76-01198

THE ALGAL MICROFLORA OF A STRING MIRE IN RELATION TO THE CHEMICAL COMPOSITION OF WATER,
Lund Univ. (Sweden). Dept. of Ecological Botany.
T. Flensburg, and J. H. Sparling.
Can J Bot, Vol 51, No 4, p 743-749. 1973.
Identifiers: *Algal species diversity, Bogs, *Chemical composition, *Desmidiales, Evastrum, Flora, Lakes, Micrasterias, Nutrients, Sphagnum-Rubellum, Stauragstrum, *String mire.

Samples (21) were examined for algal species diversity. Samples contained between one and 35 species with a mean of 10.6 species/sample. The greatest diversity of species occurred in samples collected from large flarks or bog lakes. Hummock communities, especially those with abundant Sphagnum rubellum contained fewest algae. All samples showed a predominance of Desmidiales. General ionic levels in the string mire were low; however, species of the genera Euastrum, Micrasterias and Staurastrum occurred frequently in the sites richer in nutrients. More species were found in water than in drier sites. The presence of species characteristic of more base-rich conditions may be related to the rate of water flow through the mire.--Copyright 1974, Biological Abstrac Inc.
W76-01200

LIMITED ARSENIC DISPERSION IN S WATER, SEDIMENTS, AND BIOTA NEAR CONTINUOUS SOURCE,
Fisheries and Marine Services, St Joh (Newfoundland). Biological Station.
W R Penrose, R Black and M J Hayward
Journal of the Fisheries Research Board Canada, Vol 32, No 8, p 1275-1281, August 197 fig, 6 tab, 13 ref.

Descriptors: *Arsenic compounds, *Dispersi *Sediments, *Biota, *Sea water, *Cana *Analytical techniques, Marine biology, Sodi arsenite, Photometry, Chemistry, Color reactio Instrumentation, Aquatic animals, Ocea Aquatic life, Testing procedures, Colorime Estuarine environment, Water pollution, Wa pollution sources, Path of pollutants, Mini Mine drainage, Igneous rocks, Sedimentary roc Identifiers: *Moreton's Harbor, *Arsenic disp sion, Stibnite, Sea urchin, Sand dollar, Arsi Point source.

Moreton's Harbor, Newfoundland, has been posed to arsenic-bearing drainage and leach from a stibnite mine for at least 38 yr and possi longer than 84 yr. Measurements of inorganic senic in sea water and sediments and total arse in some marine organisms revealed a very limi influence of continuous exposure to arsenic in small harbor. Arsenic concentrations in surf water declined to normal within 200 m, and in se ments within 50 m. Animals did not show sign cantly higher levels nearer the mine, with the ception of the sea urchin Strongylocentro droebachiensis, which accumulated significan higher levels of arsenic adjacent to the mine s (Henley-ISWS)
W76-01262

SEDIMENTATION OF ORGANIC MATTER ST. MARGARET'S BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (No Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 2L.
W76-01311

DECISION TO CONTROL EUTROPHICATIO
Canada Centre for Inland Waters. Burlingt (Ontario).
For primary bibliographic entry see Field 5G.
W76-01352

TROUT METABOLISM CHARACTERISTI AND THE RATIONAL DESIGN OF NITRIFIC TION FACILITIES FOR WATER REUSE HATCHERIES,
Texas Univ. at Austin. Dept. of Civil Engineerin
For primary bibliographic entry see Field 5D.
W76-01382

REUSE OF EFFLUENT FOR AGRICULTUR PURPOSES,
Commonwealth Scientific and Industrial Resear Organization, Canberra (Australia). Div. of La Use Research.
For primary bibliographic entry see Field 5D.
W76-01416

POLLUTION OF RECIPIENTS BY STORM R NOFF IN MIXED SEWER SYSTEMS: STOR RETENTION BASINS AS A REMEDY (LA PO LUTION DES EMISSAIRES PAR LES DEVE SEMENTS DES RESEAUX UNITARIES: U REMEDE LES BASSINS D'ORAGE),
For primary bibliographic entry see Field 5D.
W76-01427

ATER QUALITY BASELINE ASSESSMENT
OR CLEVELAND AREA - LAKE ERIE,
OLUME I - SYNTHESIS,
eaveland Dept. of Public Utilities, Ohio. Div. of
ilities Engineering.
r primary bibliographic entry see Field 5B.
76-01500

D. Waste Treatment Processes

SIGN GRAPHS FOR ACTIVATED SLUDGE
OCESS,
12M-Hill, Reston, Va.; and Hill (Clair A.) and
sociates, Reston, Va.
D. Mynhier, and C. P. L. Grady, Jr.
rnal of the Environmental Engineering Divi-
n, American Society of Civil Engineers, Vol
, No EE5, Proceedings paper No 11659, p 829-
, October 1975. 9 fig, 4 tab, 31 ref.

scriptors: *Activated sludge, *Curves,
raphs, *Environmental engineering, *Waste
atment, *Sedimentation, Wastewater, Kinetics,
thematical models, Design, Systems analysis,
uations, Economics, Aeration, Costs.
ntifiers: Settling, Thickening.

gineers involved with the preliminary design of
wastewater treatment system must efficiently
luate the economic impact of many alternative
cess schemes. Among the factors to consider
en evaluating the completely mixed activated
dge process are the interaction between the
ation tank and the final settler and the effect it
on the total system cost. Optimization of aera-
n and final settling tank sizes requires that
per consideration be given to the thickening
ction of the final settler. Design graphs are
sented to facilitate a rational determination of
cess unit sizes, accounting for the interaction
ween aeration and final settling tanks. The
phs for aeration tank performance are based
n mean cell residence time as the main biologi-
process parameter, while those describing final
ler operation incorporate the solids flux con-
t with the subsidence velocity expressed as a
rithmic function of the solids concentration. In
er to aid the engineer in the use of the charts,
ues of the parameters characterizing microbial
wth and sludge settling, as found in the litera-
for various industrial and municipal wastes,
presented in tabular form. The key feature of
graphs is that they allow consideration of the
ct of mixed liquor suspended solids concentra-
upon the sizing of both the aeration chamber
the final settler. Because computational time
educed to a minimum, the design engineer can
kly arrive at the MLSS concentration that
lts in the least-cost design. (Bell-Cornell)
5-01005

E PRAIRIE PLAN,
ropolitan Sanitary District of Greater Chicago,

primary bibliographic entry see Field 5C.
-01011

M POLLUTION: HOW REGULATIONS AF-
T YOU.
primary bibliographic entry see Field 6E.
-01022

IRONMENTAL, ECONOMIC, AND PHYSI-
CONSIDERATIONS IN LIQUID HAN-
NG OF DAIRY CATTLE MANURE,
York State Coll. of Agriculture and Life
nces, Ithaca. Dept. of Agricultural
nomics.
primary bibliographic entry see Field 5E.
-01023

DLOT WASTE MANAGEMENT SYSTEMS,
primary bibliographic entry see Field 5E.
W76-01024

AVERT RUNOFF POLLUTION,
W. Waltner, and E. Waltner.
Feedlot Management, Vol 15, No 5, p 35-37, May, 1973. 3 fig.

Descriptors: *Runoff, *Feed lots, *Farm wastes, *Irrigation, *Evaporation, *Playas, *Lagoons, *Waste storage, *Waste disposal, Agricultural runoff, Control, Solid wastes, Water pollution, *Drainage water.
Identifiers: Pump-out system, Land disposal.

Various evaporation and irrigation systems are used to prevent runoff pollution. Several specific feedlots and their runoff control measures are cited for feeders located in the Southwest. Some feedlot owners direct their feedlot runoff into playas. Others construct lagoons to catch the runoff and to provide a means of irrigation of adjoining land. Others use septic tanks to store the runoff water. The water is then pumped to irrigate adjoining fields. An Oklahoman constructed 2 storage ponds for consecutive storage of the wastewater and ultimate evaporation when it is pumped into shallow evaporation pans. Solids are removed to a storage area for composting. These and other systems constructed to meet individual feedlot problems show that while big feedlots in the southwest states are comparatively 'young', they are mature in grappling with pollution runoff control. (Cameron-East Central Oklahoma State)
W76-01025

EXPERIENCE WITH A SPRAY-RUNOFF SYSTEM FOR TREATING BEEF CATTLE FEEDLOT RUNOFF.
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
D. E. Eisenhauer, R. I. Lipper, and H. L. Manges.
Presented at 1973 Mid-Central Meeting, American Society of Agricultural Engineers, St. Joseph, Missouri, April 6-7, 1973, Paper No MC-73-302, 22 p. 2 fig, 11 tab, 6 ref.

Descriptors: *Waste treatment, *Cattle, *Feed lots, *Runoff, Biochemical oxygen demand, Nitrogen, Salinity, Alkalinity, Soil profile, Waste disposal.
Identifiers: *Spray-runoff system, *Pollution.

An experimental study was conducted to examine the spray-runoff technique as a possible alternative to disposal practices of beef cattle feedlot runoff. A detailed discussion of the construction of the system and test results are given. While treatment of the feedlot runoff by using the spray-runoff system did occur, a satisfactory effluent for direct release to the environment was not produced. Concentration reductions of BOD5 and Kjeldahl nitrogen were from 40-60 percent under the most favorable conditions. Mass reductions of BOD5 and Kjeldahl nitrogen were as high as 90 percent. Accumulations of salt, sodium and potassium were found in the soil profile after 29 inches of the wastewater had been applied but no serious saline or alkali hazards had developed. (Dudley-East Central Oklahoma State)
W76-01026

GRASS-FILTER SYSTEMS--ANOTHER NEW RUNOFF CONTROL METHOD.
For primary bibliographic entry see Field 5E.
W76-01028

AREA NEEDED FOR LAND DISPOSAL OF BEEF AND SWINE WASTES,
Iowa State Univ., Ames, North-Central Regional Extension Project.
For primary bibliographic entry see Field 5E.
W76-01029

LIQUID MANURE MANAGEMENT FOR SWINE,
Texas Agricultural Extension Service, College Station.
For primary bibliographic entry see Field 5E.
W76-01030

EVALUATION OF ANAEROBIC LAGOON TREATING SWINE WASTES,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
A. Shindala, and J. H. Scarbrough.
Transactions of the ASAE (American Society of Agricultural Engineers), p 1150-1152, 1972. 4 fig, 2 tab, 3 ref.

Descriptors: *Lagoons, *Anaerobic conditions, *Waste treatment, *Farm wastes, *Hogs, Odor, Waste disposal, Water pollution.

The effectiveness of a single cell anaerobic lagoon in the treatment of swine wastes was investigated. Compiled data revealed that anaerobic lagoons would provide considerable reduction in the pollutional characteristics of animal wastes. The effluent, however, was still offensive and required further treatment prior to discharge. (Marquard-East Central Oklahoma State)
W76-01032

SOME PHYSICAL AND ECONOMIC ASPECTS OF WATER POLLUTION CONTROL FOR CATTLE FEEDLOT RUNOFF,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 5E.
W76-01034

SLUDGE DISPOSAL: A CASE OF LIMITED ALTERNATIVES.
Deeds and Data, p D-1--D-4 December, 1971.

Descriptors: *Sludge disposal, *Waste treatment, *Waste disposal, Fertilizers, Irrigation, Soils, Incineration, Lagoons.
Identifiers: Land disposal, Ocean disposal.

A panel discussed alternatives for sludge disposal. Some treatment plants can transport sludge to crop lands. Guidelines can be written for heated anaerobically digested sludge to be applied at rates up to 100 dry tons/acres for any soil type. Cadmium, lead, mercury, copper and chromium in the sludge do not appear to be detrimental to crops. There are also extremely few pathogen problems. Cities like New York, however, don't have available land to dispose of effluent. Other disposal methods are incineration, ocean disposal, and lagooning. Very little survey work cost data has been published on various methods of sludge disposal. It is obvious that much more experimentation and research is needed in order to solve the sludge disposal problem. (Wetherill-East Central Oklahoma State)
W76-01035

THEY'RE GETTING THE JUMP ON POLLUTION CONTROLS,
For primary bibliographic entry see Field 5E.
W76-01036

THE PROBLEM OF FARM ANIMAL WASTE DISPOSAL,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W76-01037

MANURE WASTE PONDING STUDY,
California State Water Resources Control Board, Sacramento.
D. Baier, J. L. Meyer, and D. R. Nielsen.
Typescript, n.d., 14 p. 4 fig, 3 tab.

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Descriptors: *Farm wastes, *Waste storage, *Waste disposal, *Groundwater pollution, *Nitrates, Leakage, Denitrification, Biochemical oxygen demand, Salts, Tensiometers, Seepage Poultry, Soils, Percolation, Salinity control.
Identifiers: *Holding ponds, *Manure.

Seventeen manure holding ponds were studied to determine rates at which the ponds sealed against leakage into underlying groundwater, rates of denitrification in the ponds and stratification of chemical constituents and BOD within the ponds. Additionally, the fate of nitrates and other salts were evaluated when field-dried manure was applied as fertilizer. Tensiometric techniques were used to determine hydraulic potential gradients and to obtain samples of the soil solution beneath the ponds. The solutions were analyzed for pH, total dissolved solids (TDS), and nitrates. In addition to the analyses of the solution, soil samples taken by auger just outside the edge of the ponds from the same depths were analyzed for nitrates abd TDS. Even on coarse textured soils, ponds effectively sealed in 60 days or less. Almost no salt was lost from the ponds, but there was substantial denitrification. Applications of 40 yards of manure per acre resulted in higher nitrates in percolating leachates and slightly higher salinity than applications of 12 yards of manure per acre. (Cameron-East Central Oklahoma State)
W76-01038

BIOLOGICAL TREATMENT OF FEEDLOT RUNOFF FOLLOWING SETTLING,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
T. J. McGhee.
Presented at the 66th Annual Meeting, American Society of Agricultural Engineers, University of Kentucky, Lexington, June 17-20, 1973; Paper No. 73-413, 19 p. 12 fig, 1 tab, 13 ref.

Descriptors: *Feed lots, *Farm wastes, *Runoff, *Waste treatment, *Biological treatment, Activated sludge, Design, Costs, Chemical oxygen demand, Effluents, *Agricultural runoff.
Identifiers: Settling.

An activated sludge system designed for the treatment of settled feedlot runoff has been studied both in the laboratory and in the field. Initial studies utilizing the gravity solids return system demonstrated that reductions in COD of approximately 60% were attainable at liquid retention times of 4 days or more. From the data obtained in the laboratory study, it was concluded that the field system should be designed to operate at a liquid retention time of two days or more and at an organic loading rate of less than 1.0 lb. COD per lb. MLSS per day. Calculations based upon the average annual runoff from the lots and of the annual rates of precipitation and evaporation in eastern Nebraska indicated that the required volume would be 890 gallons assuming that operation would be possible for 180 days per year. The cost of effectively treating settled feedlot runoff with an aerobic biological system has been estimated to be $0.65 per head for the climatic conditions of eastern Nebraska. This cost is dependent upon animal density, climate, and the balance between holding pond and treatment unit size. (Cartmell-East Central Oklahoma State)
W76-01042

MODELS FOR HANDLING SOLID MANURE,
For primary bibliographic entry see Field 5E.
W76-01043

COSTS NOTED FOR SOLID AND LIQUID WASTE SYSTEM.
Feedlot Management, Vol 15, p 58, January, 1973.

Descriptors: *Waste storage, *Waste disposal, *Liquid waste, *Farm wastes, *Costs, *Solid wastes, Settling basins, Lagoons, Irrigation, Legal aspects, Missouri.
Identifiers: *Manure, *Land disposal.

An animal waste disposal system was developed that meets Missouri law with respect to keeping waters of the state clean. Basically, the system involves returning waste solids and liquids to agricultural land and preventing them from getting into water resources. The liquids are drained off into a lagoon; the solids settle out in the settling basin. Solids are deposited on the land by using a conventional manure spreader. The liquids are spread through irrigation equipment. The annual costs to own and operate the system range from a low of $0.75 per head for a 400-head operation using the hand carry system to a high of $1.37 per head for a 1,200 head operation using the traveling gun system. (Cartmell-East Central Oklahoma State)
W76-01044

DESIGN OF LONG INTERCEPTOR SEWERS,
Edinburgh City Engineer's Dept. (Scotland).
A. W. Blakey, G. F. McCreath, and M. G. D. Thomson.
Journal of the Institution of Municipal Engineers, Vol 99, No 12, p 388-343, December, 1972. 4 fig, 3 tab, 6 ref.

Descriptors: *Sewers, *Sewerage, Rainfall intensity, Computers, Hydrographs, Interceptor sewers.
Identifiers: Storm profiles.

A method of designing long interceptor sewers taking into account rainfall characteristics in assessing their flow-carrying capacity is described. The design procedure proposed involves examination of the effect of undulating storm profiles associated with prolonged nearly-continuous rainfall of moderate intensity as alternatives to the Bilham/Holland type of storm profile with its single peak of high rainfall intensities of relatively short duration. The use of a computer is essential due to the large number of calculations involved with a printout obtainable for each hydrograph with peak values reduced to simulate the effect of storm overflow devices. The final hydrograph printouts can be stored for use as input hydrographs on a final computer run for the sizing of the interceptor sewer using a sub-area technique. Alternatively, the input data file can be prepared to include all existing trunk sewer systems with the new interceptor sewer system and to specify maximum rate of flow values at overflow positions. This avoids the necessity for individual trunk sewer designs for each different storm profile used. (Sandoski-FIRL)
W76-01047

SEWER IN FLOOD PLAIN MUST FIGHT INFILTRATION.
Public Works, Vol 104, No 1, p 66-67, January, 1973. 2 fig.

Descriptors: *Plastic pipes, *Sewers, Flood plains, Missouri River, Infiltration, Flow rates, Installation, Pipes.
Identifiers: *Flextran.

The development of a 1300-acre balanced urban community built along the Missouri River resulted in high flow rate and tight infiltration specifications for the sewer line installed beneath the flood plains. Flextran, a new fiber glass reinforced polyester resin pipe made by Johns-Manville, was used for the sewer line. This flexible conduit is composed of polyester resin and siliceous sand, reinforced with continuous roving glass fibers, is completely non-metallic, and avoids electrolytic or galvanic corrosion. An isophthalic polyester resin gives the pipe its resilience, resistance to moisture, and high dimensional stability. This sand is a functional low-cost filler for wall thickness to meet the internal and external pipe requirements used in gravity transmission of water and waste water. By using Flextran, with its high flow rate, a reduction in sewer line slope as well as the number of pum ing stations was accomplished. Installation w fast and trouble free due to Flextran's lightweig and longer segment lengths. (Sandoski-FIRL)
W76-01048

SYNCHRONIZED TEAM HANDL HEAVYWEIGHT SEWER PIPE COMBIN TIONS,
Construction Methods and Equipment, Vol No 12, p 40-42, December, 1972. 8 fig.

Descriptors: *Sewers, *Construction, Constr tion equipment, Soils, Timber piles, Trenches, stallation, Pipelines, Pipes.

A $22.8 million sewer outfall laying job includ installations of 16,250 feet of pipe with prec caps and cradles, 11,000 feet of H-pilings, 137,000 feet of timber piling has been perform along Long Island. Trenching the line remov two million yards of sand, silt, and bog mate resulting in a 25-foot wide base, 4 to 6 feet bel pile cutoff. Dredging and pile driving started fr the center permitting a constant shore feed materials out to the pile and pile barges as well backfilling in the most effective sequences. T 400 x 40-foot pipelaying barge, stabilized for ex heavy lifting and lowering by external ballast ta and water-filled compartments within its h houses two 60-foot independently operated c rick booms. These booms, mounted on a structu steel base that travels on rails the length of barge, are equipped with 16-part 1.25-inch lift cables and powered by a four-drum skagitt ho ing engine. Assembled 100-foot pipe strings barged alongside the twin derricks, lowered i the trench, and bolted to the preceeding str Timber piles supporting the pipe strings are dri in the trench by two cranes working from a 34 40-foot modified carfloat in an area 260 feet lo To insure accuracy of specifications requiring p joints to fall four feet from the center-line of e pile bent, 5-, 6-, and 8-pile bents are positio with three templates. (Sandoski-FIRL)
W76-01049

INSERTION OF POLYETHYLENE P RENEWS DAMAGED SEWER,
Montgomery Water and Sanitary Sewer Boa Ala.
For primary bibliographic entry see Field 8A.
W76-01050

HOW TORONTO IS INSTALLING SEWE WITHOUT DISTRUPTING TRAFFIC FLOW,
L. Webster.
Engineering and Contract Record, Vol. 85, No. p 56-57, December, 1972. 3 fig.

Descriptors: *Storm drains, *Sewers, Tunn Pipes, Excavation, Installation.
Identifiers: Toronto, Canada, Coring system.

Use of a new coring system has enabled Toro road authorities to install 2.6 miles of 12- to 48-i storm sewer lines under existing roadways with disruption to traffic or the existing road surfa The coring system centers around a hydraulic and a series of specially developed cutting he Technique for coring a service line involves s ing a shaft at the end of the line (no more than feet apart) and excavating to the necessary w ing depth below the grade of the service. Drill r are slowly pushed towards the target excavat expanders widen the hole compressing the around the perimeter and preventing colla and, subsequent passes are made with a co tool that cuts the selected diameter shaft, c pressing the walls of the tunnel and passing spoil through the center. Once the fulldiam shaft is completed, the same coring tool is use insert the lengths of pipe. Gor this, the section pipe are fed to the target excavation and inse in the hole spigot-end first. An attachment on

rilling tool is used to pull the pipe sections back to the shaft. As each bell end is about to enter ie shaft, another pipe section is permanently oined to it and the combined sections are again ulled in. This process is repeated until the pipe aches the original excavation. (Sandoski-FIRL)
76-01051

SYSTEMATIC AND THEORETICAL STUDY F SEWERAGE REMODELLING PLANS, I. IVER TURBIDITY CONTROL AND THE AD-JSTMENT OF CROSSSECTIONS (GESUIDO EIBI KEIKAKU NI KANSURU SHISUTEMU-ONTEKI KENKYU I. TOKU NI KASEN DAKU SEIGYO TO MEN SEIBI NI TSUITE),
. Daimon, T. Tsutsumi, and M. Nakamura.
reprint, 9th Conference on Sanitary Engineering, nuary 29-30, 1973, Sendai, Japan. (Japanese ciety of Civil Engineering, Committee on Sani-ry Engineering), p 48-55. 13 fig, 6 ref.

escriptors: *Model studies, *Sewerage, *Rivers, rbidity, Load distribution.
entifiers: Remodeling.

udies on sewerage system remodeling plans ex-nine the local load distribution subsystem from e standpoint of river turbidity and the sewerage oss section readjustment. Viewing a sewerage oss section at a given time shows the turbidity of e river and offers data for point investment and ie investment. Indexes between two points of a odel are considered in order to obtain the time ogress of local load distribution. Model formula-n which entails a system model and a cut, an uation of state, operating variables, control con-tions, and evaluation functions is detailed. This odel is applicable not only to a basin with a raight river, but also for basins containing paral-ing or ramified river systems. (Sandoski-FIRL)
76-01055

HE SEWAGE SLUDGE + RUBBISH + CIN-ERS EQUATION SOLVED AT THE NEW RBAN WASTE TREATMENT PLANT IN IEPPE (L'EQUATION BOUES D'EGOUT + RDURES + MACHEFER EST RESOLE DANS ES NOUVELLES INSTALLATIONS DE RAITEMENT DES DECHETS URBAIN EALISEES A DEIPPE),
Marchand.
echniques et Sciences Municipales, Vol 67, No , p 381-391, October, 1972. 4 fig.

escriptors: *Waste water treatment, *Treatment cilities, Incineration, Aeration, Effluents, lorination, Sludge, Rivers, Municipal wastes.
entifiers: Dieppe, France, Secondary decanta-n, Sludge thickening.

combined municipal waste incineration and ste water treatment plant in Dieppe, France, in-udes a waste water treatment unit with a capaci-of 8000 cu m/day and an average BOD5 content 250 mg/liter. The purification efficiency of the 5 cu m aeration tank for primary decantation is percent. The effluent from the aeration tank is scharged into a river before secondary decanta-n and chlorination. The sludge is gradually ckened to 94 percent in the digester kept at a mperature of 29-35 C, and further to 91 percent ter content in a thickener. After the water con-t is reduced to 40-45 percent by drying with am from the waste incineration plant, the hydrated sludge is sent to the incinerator. The ses escaping from the sludge during treatment erations are stored for admission into the waste inerator. (Sandoski-FIRL)
76-01056

STEM FOR REGULATION OF COMBINED WAGE FLOWS,
V. Gibbs, S. M. Alexander, and C. P. Leiser.
urnal of the Sanitary Engineering Division, nerican Society of Civil Engineers, Vol 98, No SA 6, p 951-972, December, 1972. 9 fig, 3 tab, 6 ref.

Descriptors: *Combined sewers, *Automatic control, *Sewers, Monitoring, Computers, Flow control.
Identifiers: Seattle, Washington, Computer Augmented Treatment and Disposal(CATAD).

As an alternative to the construction of separate drainage systems, the use of storage in trunk and interceptor sewers for regulation of combined sewage flow within the capacity of the interceptor is proposed. The computer-directed system, known as Computer Augmented Treatment and Disposal (CATAD), represents a procedure for maximum utilization of available storage in trunk and interceptor sewers to reduce or completely eliminate overflow. The CATAD system controls comprise a computer-based central facility for automatic control of remote regulator and pumping stations in Seattle, Washington. The installation of equipment at the central station and at 32 remote stations was completed in 1971. All required programming for data acquisition, central station console operation, satellite terminal operation, supervisory commanding, events recording, and data logging is now complete. The system is in continuous operation for system monitoring and is being tested for control in a supervisory mode. Routines for automatic control have been substantially completed and are being integrated systematically with other functions. (Sandoski-FIRL)
W76-01057

CENTRALIZED CONTROL SYSTEM OF SEWERAGE (GESUIDO SHUCHU SEIGYO SHISUTEMU),
T. Ohto, S. Nogita, H. Iwaki, S. Mori, and T. Onodera.
Hitachi Hyoron, Vol 54, No 10, p 919-923, October, 1972. 9 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Sewerage, Storm runoff, Drainage practices, Sewage treatment, Activated sludge, Biochemical oxygen demand, Rainfall-runoff relationships, Water quality, Infiltration.
Identifiers: Japan, Toxic materials.

In the past, Japanese sewerage water drainage practices were based primarily on a combined sewage and storm water runoff system. More recently, installation of divided drainage is promoted with secondary sewage treatment being performed by activated sludge, which is not less costly but whose result and activity are dependent on biochemical reactions. The biochemical oxygen demand capacity fluctuates largely due to rainfall-runoff relationships though seasonal differences should be considered as well as the change of water quality by rain and toxic material infiltration. In the activated sludge process, the biological phase is complex, and the sludge recycling system further complicates the behavior of the sludge. The structure of a process simulator, the unit calculation program, and a centralized sewage and monitoring and control system are presented. The centralized control system has a capacity for security control, optimum control, and a man-machine communication. (Sandoski-FIRL)
W76-01058

TOWARDS RATIONAL DRAINAGE DESIGN,
For primary bibliographic entry see Field 4A.
W76-01061

PVC PIPE CUTS COLORADO DISTRICT'S FLOW COST,
North Table Mountain Water and Sanitation District, Colo.
For primary bibliographic entry see Field 8G.
W76-01063

DESIGN AND OPERATION OF A FEEDLOT RUNOFF TREATMENT SYSTEM,
University of Nebraska, Lincoln Department of Civil Engineering.
D. S. Backer.
MS Thesis, 1973, 46 p, 10 fig, 9 tab, 34 ref.

Descriptors: *Waste water treatment, *Runoff, *Feed lots, *Design, Operation and maintenance, Equipment, Costs, Automation, Odor, Aeration, Chemical oxygen demand, Suspended solids, Effluent, Hydrogen ion concentration, Analysis, Farm wastes.

This study dealt with the design, start up, and operation of a pilot plant built to treat feedlot runoff. The plant's purpose was to provide a system which was substantially automatic and economical in operation. The plant was evaluated for simplicity of construction, ease of operation and maintenance, cost of operation, effectiveness of treatment, and comparability to the laboratory unit. The design of the pilot plant was based on an aerobic unit that featured an air lift pump to return solids to the aeration chamber. Laboratory analyses were run on pH, chemical oxygen demand, and suspended solids. COD and suspended solids removals increased with increased detention time. The unit operated in the pH range 6.5-8.5. The net cost per animal was approximately $.60 for the experimental system. The field unit was easy to construct, required very little maintenance and was simple to operate. (Cartmell-East Central Oklahoma State)
W76-01088

BASIC PERFORMANCE PARAMETERS FOR OXYGENATION AND LIQUID CIRCULATION IN ROTOR-AERATED LIQUID WASTE SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
G. L. Nelson, J. J. Kolega, U. Agena, Q. Graves, and G. Hoffman.
Presented at 1968 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, Dec 10-13, 1968, American Society of Agricultural Engineers, St. Joseph, Michigan. Paper No 68-932, 41 p, 15 fig, 5 tab, 17 ref.

Descriptors: *Rotors, *Performance, *Liquid wastes, Equations, Livestock, Farm wastes, Waste water treatment.
Identifiers: Rotor-aerated tank, Oxygen transfer, Liquid circulation.

A study was made of performance characteristics of rotor-aerated ditch or tank systems for livestock wastes. The purpose was to: (1) identify the physical parameters that characterize oxygen transfer and liquid circulation effects in a rotor-aerated liquid waste system; and (2) based on these parameters, to develop prediction equations for oxygen transfer and for liquid circulation effects for one class of rotors. The study included experiments with two laboratory models, one each for oxygenation and liquid circulation. Conclusions include: (1) For a class of rotors, the dimensionless oxygen transfer parameter can be predicted for system design and operating purposes, (2) the oxygen transfer coefficients, km, of two geometrically similar rotors are directly proportional to the ratios of the products. (3) liquid velocity for rotor-driven circulation in a ditch can be estimated, (4) the ratio of channel length to width is non-critical in the range 5.8 to 10.0, and (5) the rotor Froude number is critical below a value of 0.15 for liquid circulation effects in a rotor-driven ditch. (Camerob-East Central Oklahoma State)
W76-01092

THESE STOCKYARDS' SOLUTIONS COULD WORK FOR YOU.
Feedlot Management, Vol 15, No 5, p 48-52, May, 1973. 3 fig.

LIBRARY U. OF I. URBANA-CHAMPAIGN

Descriptors: *Livestock, *Farm wastes, *Feed lots, *Management, Waste treatment, Waste disposal, Lagoons, Incineration.
Identifiers: *Stockyards.

A tour of several livestock markets turned up a number of methods for successfully handling livestock wastes. These techniques might be adaptable to feedlot operations. Features that will make waste removal faster and more efficient include a flow- through alley system, new concrete floors to replace brick floors, and steel pens instead of wooden ones. Most large markets are successfully meeting the challenge of controlling pollution. Major remodeling programs, and such new concepts as lagoon systems, disposal districts, and incinerators require large financial expenditures. (Cartmell-East Central Oklahoma State)
W76-01093

FARMLAND FARM STRESSES NO RUNOFF, LATEST TEST RESULTS.
Feedstuffs, Vol 46, No 50, p 13, December 9, 1974. 6 fig.

Descriptors: *Agricultural runoff, *Livestock, *Experimental farms, Research and development, Ditches.
Identifiers: Oxidation ditches, Waste handling.

At Farmland Industries new research and demonstration farm, there is no runoff of livestock wastes into nearby ditches or creeks. Located at Piper City, Kansas, the farm is fully self-contained. Oxidation ditches and aerobic bacteria solve the manure handling problems in the swine, poultry and dairy units. The research farm includes a swine unit, consisting of farrowing house, nursery, finishing house and gestation barn. The poultry unit has a capacity of 4,400 layer hens in two houses. It is environmentally controlled and the cages are over an oxidation ditch. The beef cattle unit has a 300-head capacity. The 20 pens of cattle also serve as test groups of feed formulations or comparisons of competitive brands. Other facilities on the farm include a feed mill, a stable for 6 horses, a show arena, a necropsy unit with laboratory and post-mortem facilities, and a waste research facility for studying new and improved methods of animal waste disposal. The work at Farmland is closely coordinated to make test results most meaningful to co-op members in their own farming and ranching. (Cameron-East Central Oklahoma State)
W76-01094

REMOVAL OF PHOSPHATES AND METALS FROM SEWAGE SLUDGES,
Waterloo Univ. (Ontario). Dept. of Chemical Engineering.
D. S. Scott, and H. Horlings.
Environmental Science and Technology, Vol 9, No 9, p 849-855, September, 1975. 5 fig, 7 tab, 11 ref.

Descriptors: *Heavy metals, *Iron, *Aluminum, *Zinc, *Pollutants, Sewage treatment, Sewage sludge, Phosphates, Chemical precipitation, Separation techniques, Hydrogen ion concentration, Acid-base equilibrium, Reclamation, Recycling, Solubility, *Sludge treatment, Waste water treatment, Sludge.
Identifiers: *Metal extraction, Fractionation, Selective precipitation.

The sludges produced from wastewater treatment plants contain most of the phosphate and metallic cations present in the water being treated. A technique is presented to remove these materials from the sludge with a high yield so that crude metal-phosphate products can be recovered and recycled. Iron, aluminum, zinc, and phosphate are the major elements recovered. Anaerobic sludge underflow and a filter cake produced from an anaerobic sludge were extracted in an acid mixture and the extract filtered. Metal ion and phosphate ion precipitation was carried out by slow addition of either a sodium hydroxide or a calcium hydroxide solution, with continuous stirring and monitoring of the pH. Graphs show the degree of extraction of metals and phosphate under various acid conditions and their sequence of precipitation as the extract pH is adjusted. (Davis-Vanderbilt)
W76-01100

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics; and Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-01104

REMOVAL OF DISSOLVED MOLYBDENUM FROM WASTEWATERS BY PRECIPITATES OF FERRIC IRON,
Colorado Univ., Boulder. Dept. of Geological Sciences.
G. R. LeGendre, and D. D. Rennells.
Environmental Science and Technology, Vol 9, No 8, p 744-749, August, 1975, 6 fig, 2 tab, 35 ref.

Descriptors: *Heavy metals, *Iron, *Iron compounds, *Molybdenum, *Chemical precipitation, *Waste water treatment, Adsorption, Mine water, Iron oxides, Toxicity, Effluents, Sediments, Hydrogen ion concentration, Streams, Spectrophotometry, Filtration, Colorado.
Identifiers: *Flocculant hydroxides, *Climax molybdenum mine, *Atomic absorption, *Open pit copper mines, Uranium mills, Clear creek, Ten mile creek(Colo).

A method was developed to remove dissolved molybdenum from aqueous effluents. In the presence of ferric hydroxide at a low pH, more than 95% of total dissolved molybdenum was removed from each of three mill waters tested. The ratio of dissolved ferric iron to dissolved molybdenum must exceed about 10:1 for best results. Under these conditions adsorption or coprecipitation occurs, although the exact mechanism is not completely understood. A field example is given, taking place in a stream in Colorado that receives dissolved molybdenum from a mining and milling operation. Filtration studies using a 0.01-micron filter show that molybdenum cannot be removed by filtration unless it has first been precipitated as described above. Graphs and tables show removal of molybdenum as a function of pH and amount of ferric iron present. Molybdenum was measured using a modified colorimetric thiocyanate procedure. Iron was measured by atomic absorption. (Davis-Vanderbilt)
W76-01106

FLOATATION AERATOR FOR AERATING AND MOVING WATER,
R. A. Cramer, Jr.
U. S. Patent No 3,865,909, 5 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 859, February 11, 1975.

Descriptors: *Patents, *Waste water treatment, Aeration, *Water pollution control, *Pollution abatement, Equipment, Oxygenation, Diffusion, Dispersion.
Identifiers: Submersible motors.

A water moving apparatus which also aerates water includes a float member floating on a body of water and tethered in a selected position. A submersible motor is supported by the float and is suspended by the float in the water. It has a propeller that operates to propel water upward through an opening in the float. A diffusing or dispersing member is mounted above water level on the float coaxial with the propeller and opening whereby operation of the motor and propeller directs water against the diffuser to effect an u
ward and outward discharge of water resulting
aeration of the water. (Sinha-OEIS)
W76-01129

WASTE WATER TREATMENT PROCESS,
Du Pont de Nemours (E. I.) and Co., Wilmingto
Del. (assignee).
D. G. Hutton, and F. L. Robertaccio.
U. S. Patent No 3,904,518, 8 p, 1 fig, 9 tab, 12 r
Official Gazette of the United States Patent O
fice, Vol 938, No 2, p 766, September 9, 1975

Descriptors: *Patents, *Waste water treatme
*Water quality control, *Water pollution contr
*Biological treatment, *Oxidation, Industr
wastes, Domestic wastes, Activated carbo
Hydrogen in concentration
Identifiers: Fuller's earth.

An improvement in the process of continuou
purifuing waste water is described. It is compris
of the following steps: contacting in a treatme
zone a mixture of waste water which has a pH
between about 4 and 11 and which optionally h
been subjected to primary treatment to remo
solids, and biologically active solids in an amou
sufficient to provide a total suspended solids co
tent of the mixture of between about 10 and 50,0
parts per million; mixing a gas containing molec
lar oxygen through the mixture; and removing t
mixture from the treatment zone. The improv
ment consists of adding to the mixture betwe
about 50 and 1500 parts of activated carbon
between about 250 and 2500 parts of adsorpti
fuller's earth per million parts of feed waste wat
The carbon or fuller's earth should have a surfa
area of at least 100 square meters per gram and
particle size such that it will pass through a 2
mesh per inch sieve. (Sinha-OEIS)
W76-01132

**METHOD AND APPARATUS FOR PURIFIC
TION,**
K. Stopka.
U.S. Patent No 3,904,521, 8 p, 15 fig, 11 ref; Of
cial Gazette of the United States Patent Offic
Vol 938, No 2, p 766-767, September 9, 1975.

Descriptors: *Patents, *Waste water treatme
*Water purification, *Water pollution contr
*Water quality control, *Industrial waste
*Sewage treatment, *Oxidation, Ozone, Flotatio
Identifiers: Cyanide.

A method and apparatus are described which ut
ize an ozone containing atmosphere for the oxid
tion of waste materials. The water containi
waste is propelled in a chamber in the form
small droplets into an ozone containing
mosphere with at least some of the droplets hitti
the walls of the chamber. The droplets which h
the chamber walls form a thin film on the walls a
run down to the body of water. The droplet si
should be such that a majority of the droplets w
not remain suspended in the atmosphere to form
humid atmosphere but will fall back to the body
water so that purified water is returning contin
ously to the body of water. A suitable range
droplet size is from about 5 to about 50 micron
This preconditioned liquid is picked up and e
posed to a fresh ozone atmosphere in a seconda
and subsequent chamber arranged in series. Th
number of succeeding chambers depends on th
degree of contamination of the liquid. In anothe
aspect of the invention a method and apparatu
referred to as an electric coagulator is provided f
continuously removing matter from water by flot
tion. The water containing suspended matter
subjected to electrolysis, thereby producin
hydrogen bubbles, which ascend to the surface
the water carrying the suspended matter where
can be removed. (Sinha-OEIS)
W76-01135

ADIATION TREATMENT METHOD AND APARATUS FOR DECONTAMINATION OF POLUTED FLUID,
nergy Systems, Inc., New York. (assignee).
. Lund, K. J. Bialy, L. A. Mann, and D. D. oodbridge.
. S. Patent No 3,904,882, 4 p, 3 fig, 6 ref; Official azette of the United States Patent Office, Vol 8, No 2, p 866-967, September 9, 1975.

escriptors: *Patents, *Waste water treatment, ewage treatment, *Water pollution control, Vater quality control, *Radiation, *Disinfection, amma rays, Effluents, Liquid wastes, Septic nks.

radiation treatment method and apparatus are closed for the safe disinfection and decontamination of liquid waste, such as sewage. Liquid aste is processed by removing some solids from e effluent, irradiating the effluent less some lids with a gamma radiation field and percolating e disinfected effluent, or discharging the disinfected liquid into sewage conduits or into streams other bodies of water. The disinfecting chamber a box constructed of concrete or other compati- material, having a radiation shielding cover, d having an inlet at one end and an exit at the er end. Baffles located in the box produce sired distribution and turbulence of flow. urces of ionizing radiation, usually gamma diation, are placed in the chamber in such a nner as to provide a relatively uniform radiation ld in the effluent passing through the system. nha-OEIS)
76-01136

ETHOD AND APPARATUS FOR PURIFYING ASTE WATER,
Minegishi.
S. Patent No 3,905,890, 5 p, 6 fig, 9 ref; Official zette of the United States Patent Office, Vol 3, No 3, p 1230, September 16, 1975.

scriptors: *Patents, *Waste water treatment, dustrial wastes, *Water purification, *Water ality control, *Water pollution control, lectrolysis, *Flocculation, Coagulation, Electdes, Separation techniques.

nethod of purifying waste water comprises out electrolysis of water in a defined area of a ves- in order to form oxygen and hydrogen. A flow waste water is directed into the electrolysis area subject it to the influence of the newly formed ygen and hydrogen to cause promotion of nuclei mation. This causes a bonding coagulation of waste material around the nuclei. Included is a sel having an inner wall with an overflow for water and for flocculated waste which is ected into a separating chamber for the removal the solid waste material. The vessel includes a tral tubular conduit having spaced electrodes ich are subjected to a DC potential in order to duce electrolysis. After coagulation the waste terial and remaining liquid are discharged into liquid of the vessel and permitted to float to the which includes an overflow portion for the aration of the purified liquid from the floccud material. The vessel includes a filter at its tom for the passage of filtered liquid. (Sinha-IS)
6-01137

THOD OF WASTEWATER TREATMENT,
otrol Corp., Milwaukee, Wis. (assignee).
N. Torpey.
S. Patent No 3,905,899, 4 p, 5 fig, 2 ref; Official zette of the United States Patent Office, Vol , No 3, p 1233, September 16, 1975.

criptors: *Patents, *Wastewater treatment, wage treatment, *Water pollution treatment, ater pollution control, *Biological treatment, aration techniques, Settling basins, degradation, Equipment.

An improved wastewater treatment tank employs a biological treatment zone, including rotating biological contactors in its upper portion and a settling zone for solid materials sloughed off the contactors and present in the wastewater in its lower portion. The settling zone is beneath the biological contactors and is physically separated from the biological treatment zone by a longitudinal baffle with forms a 'false bottom'' for the biological treatment zone. The longitudinal baffle extends the full width of the tank. Wastewater entering the treatment tank is forced through the biological treatment zone aided by the pumping effect of the rotating contactors. Rotating the contactors results in carrying forward any solids settled out of the wastewater in the biological treatment zone, thereby preventing solid buildup. (Sinha-OEIS)
W76-01138

EXPERIMENTAL EUTROPHICATION OF TERRESTRIAL AND AQUATIC ECOSYSTEMS. FIRST ANNUAL REPORT OF THE UPLAND RECHARGE PROJECT,
Brookhaven National Lab., Upton, N. Y. Biology Dept.
G. M. Woodwell, J. Ballard, M. Small, E. V. Pecan, and J. Clinton.
Report BNL 50420 (Biology and Medicine--TID-4500). February 1974. 29 p, 17 fig, 11 tab, 10 ref, 3 append. AEC AT(30-1)16.

Descriptors: *Sewage treatment, *Vegetation, *Nutrient removal, Recharge, New York, Marshes, Ponds, Water reuse, Observation wells, Agriculture, Grasslands, Nutrients, Groundwater, Forests, Irrigation.
Identifiers: *Brookhaven(N.Y.), Nutrient recycling, Terrestrial systems, Aquatic systems.

The alternatives to dumping nutrient-laden freshwater into coastal oceans by using natural or manmade ecosystems dominated by higher plants to reclaim water and trap nutrients in forms that may provide recycling loops to civilization were explored. Groundwater quality in the experimental test plots varied and was correlated with vegetation. The highest quality was associated with undisturbed forest. Nitrogen and calcium concentrations tended to be high under agricultural fields, lower under old fields and pine forests, and lowest under late successional oak-pine forests. After sewage was applied to those ecosystems for six months, through fall and winter, iron and phosphorus were totally absorbed in the biota and soil and sulfur and magnesium were partially absorbed. The absorption capacity of potassium and calcium was progressively reduced and sodium and chloride were not absorbed. Nitrate nitrogen rose from September-December in percolate of oak-pine forest treated with primary effluent, but reached a maximum on November 1 in the forest treated with secondary effluent. In aquatic systems, meadows functioned effectively during winter to reduce sewage organic content and specific conductance. Behavior of these systems through the year were to be investigated in the spring and summer of 1974. Combined aquatic and terrestrial systems will probably be most effective. (Buchanan-Davidson--Wisconsin)
W76-01155

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR NEW SOURCES. BEET SUGAR PROCESSING SUBCATEGORY OF THE SUGAR PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01204

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE MAJOR INORGANIC PRODUCTS SEGMENT OF THE INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
E. E. Martin.
Avialable from the National Technical Information Service, Springfield, Va 22161, as PB-238 611, 10.50 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-077-a, March, 1974. 369 p, 83 fig, 85 ref, 78 tab. 68-01-1513.

Descriptors: *Chemical industry, *Waste water treatment, *Inorganic compounds, *Water quality standards, Water pollution control, Industrial wastes, Wastes, Water pollution sources, Calcium chloride, Chlorine, Calcium hydroxide, Potassium, Sodium chloride, Sodium hydroxide, Sodium sulfate, Water quality, Standards, Ecnomics, Chemicals, Effluents, Regulation, Sulfur compounds, Calcium compounds, Sodium compounds, Potassium compounds.
Identifiers: Aluminum chloride, Aluminum sulfate, Calcium carbide, Hydrochloric acid, Hydrofluoric acid, Calcium oxide, Potassium chromate, Potassium hydroxide, Potassium sulfate, Sodium carbonate, Sodium silicate, Sulfuric acid, Titanium dioxide, Aluminum compounds.

An extensive study of the inorganic chemicals manufacturing industry led to the development of effluent limitation guidelines and standards. The effluent limitation guidelines presented set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the degree of effluent reduction attainable through the application of the best available technology economically achievable. The guidelines cover effluents produced during the manufacture of aluminum chloride, aluminum sulfate, calcium carbide, calcium chloride, chlorine, hydrochloric acid, hydrogen peroxide, hydrofluoric acid, calcium oxide and calcium hydroxide, nitric acid, potassium chromates, potassium hydroxide, potassium metal, potassium sulfate, sodium bicarbonate, sodium carbonate (soda ash), sodium chloride, sodium dichromate, sodium hydroxide, sodium metal, sodium silicate, sodium sulfate, sodium sulfite, sulfric acid, and titanium dioxide. Based on the application of the best practicable technology currently available, 12 of the chemicals can be manufactured with no discharge of waste water pollutants while 20 of the chemicals can be manufactured without discharge of pollutants through application of the best available technology economically achievable. Supporting data and rationale for development of the effluent limitation guidelines and standards of performance are discussed. Chemical manufacturing processes, wastes, and waste treatment processes and costs are described. (Witt-IPC)
W76-01205

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE RED MEAT PROCESSING SEGMENTS OF THE MEAT PRODUCTS AND RENDERING PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
J. D. Denit.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 836, $7.50 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-012-a, February, 1974. 188 p, 25 fig, 47 ref, 18 tab. 68-01-0593.

Descriptors: *Food processing industry, Waste water treatment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution, Water pollution control, Water quality control, Waste treatment, Costs, Operating costs, Capital

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costs, Recirculated water, Recycling, Separation techniques, Filtration, Aeration, Biological treatment, Regulation.
Identifiers: *Meat packing industry, *Slaughterhouse wastes, Packaging.

The results of an extensive study of the meat packing industry for the purpose of developing effluent limitation guidelines and standards for the industry are presented. Only red meat slaughterhouses (packinghouses) were included in this study. Plants that only process meat but do no on-site slaughtering, rendering operations carrried out off the site of the packing plant, and all poultry (white meat) processing plants were not included. Effluent guidelines are set forth for the degree of effluent reduction attainable through the application of the best practicable control technology currently available, and the best avialable technology economically achievable, which must be achieved by July 1, 1977, and July 1, 1983, respectively. The proposed recommendations require the best biological treatment technology currently available for discharge into navigable water bodies by 1977. The technology is represented by anaerobic plus aerated plus aerobic lagoons with efficient solid-liquid separation, or their equivalent. The recommendation for 1983 calls for the best biological, chemical and/or physical treatment and in-plant controls. In this instance, efficient biological treatment is complemented by water conservation practices, improved nutrient removal, and water filtration. When suitable land is avialable, land disposal may be an economical option to eliminate any direct direct discharge. Recycle or reuse of effluents in the plant is another alternative. Processes, wastes, and waste treatment processes and their costs are discussed. (Witt-IPC)
W76-01206

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE MILLS POINT SOURCE CATEGORY,
Enivronmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
J. D. Gallup.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 832, $8.00 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-022-a, June, 1974. 255 p, 20 fig, 216 ref, 31 tab. 68-01-1515.

Descriptors: *Industrial wastes, *Waste water treatment, *Textiles, *Water quality standards, Water pollution treatment, Wastes, Water pollution sources, Water pollution, Water pollution control, Water quality control, Waste treatment, Costs, Operating costs, Capital costs, Cotton, Suspended solids, Effluents, Filtration, Biological treatment, Coagulation, Regulation.
Identifiers: *Textile industry, Wool, Synthetic fibers.

The findings of a study of the textile industry for the purpose of developing waste water effluent limitations cover cotton, wool, and synthetic fabric and fiber finishing. Effluent limitation guidelines are set forth for the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the best available technology economically achievable. The proposed regulations require in-plant waste management and operating methods, together with the best secondary biological treatment technology currently available for discharge into navigable water bodies. This technology is represented by preliminary screening, primary treatment (wool scouring only), coagulation (carpet mills only), and secondary biological treatment. In addition, multimedia filtration or its equivalent for the control of total suspended solids is recommended for new plants. Supporting data and rationale for development of the proposed effluent guidelines and standards are included. Processing techniques, wastes, and waste treatment processes and costs are discussed (Witt-IPC)
W76-01207

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS - FEEDLOTS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div
For primary bibliographic entry see Field 5G
W76-01208

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SYNTHETIC RESINS SEGMENT OF THE PLASTICS AND SYNTHETIC MATERIALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01209

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SMELTING AND SLAG PROCESSING SEGMENTS OF THE FERROALLOY MANUFACTURING POINT SOURCE CATEGORY,.
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01210

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE DAIRY PRODUCT PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01211

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE UNBLEACHED KRAFT AND SEMICHEMICAL PULP SEGMENT OF THE PULP, PAPER, AND PAPERBOARD MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01212

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BASIC FERTILIZERS CHEMICALS SEGMENT OF THE FERTILIZER MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01213

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE STEEL MAKING SEGMENT OF THE IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guelines Div.
For primary bibliographic entry see Field 5G.
W76-01214

DEVELOPMENT DOCUMENT FOR EFFLUEN LIMITATIONS GUIDELINES AND NE SOURCE PERFORMANCE STANDARDS FO THE INSULATION FIBERGLASS MANUFA TURING SEGMENT OF THE GLASS MAN FACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washingto D.C. Effluent Guidelines Div
For primary bibliographic entry see Field 5G.
W76-01215

DEVELOPMENT DOCUMENT FOR EFFLUEN LIMITATIONS GUIDELINES AND NE SOURCE PERFORMANCE STANDARDS FO THE APPLE, CITRUS, AND POTAT PROCESSING SEGMENT OF THE CANNE AND PRESERVED FRUITS AND VEGETABL POINT SOURCE CATEGORY,
Environmental Protection Agency, Washingto D.C. Effluent Guidelines Div
For primary bibliographic entry see Field 5G.
W76-01216

DEVELOPMENT DOCUMENT FOR EFFLUEN LIMITATIONS GUIDELINES AND NE SOURCE PERFORMANCE STANDARDS FO THE BUILDING, CONSTRUCTION, AN PAPER SEGMENT OF THE ASBESTOS MAN FACTURING POINT SOURCE CATEGORY,
Environemental Protection Agency, Washingto D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01217

PROMISING TECHNOLOGIES FOR TREA MENT OF HAZARDOUS WASTES,
National Environmental Research Center, Cinci nati, Ohio.
R. E. Landreth, and C. J. Rogers.
Available from the National Technical Inform tion Service, Springfield, Va 22161, as PB-238 14 $4.00 in paper copy, $2.25 in microfiche. EPA R port 670/2-74-088, November, 1974. 45 p, 6 fig, ref.

Descriptors: *Waste water treatment, *Industri wastes, *Toxicity, Wastes, Water pollutio sources, Water pollution treatment, Heavy meta Organic compounds, Acids, Alkalis(Bases), Sol wastes, Liquid wastes, Pesticides, Biologic treatment, Ion exchange, Microwaves, Radiatio Osmosis, Activated carbon, Adsorption, Wat pollution control, Waste treatment, Hazard Chlorination, Chlorine, Catalysts, Oxidatio Biodegradation.
Identifiers: *Ultrafiltration.

Numerous toxic and hazardous wastes are bei generated and improperly treated and disposed by industrial sources. This study was undertak to identify and recommend promising treatme technologies for these wastes. Literature searche site visits, and personal communications with e perts in the field provided the basis for identifyi needed treatment technologies. Most hazardo waste streams are mixtures of pesticides, heav metals, organic solvents, acids, or bases, and ha a high solids concentration. Treatment process that appar applicable for processing ho homogeneous and heterogeneous hazardous was streams include chemical, biological, and physic treatments. Recommended promising techniqu for treating hazardous waste streams inclu chlorinolysis, decomposition by acids, and base chemical oxidation, biological degradation, catal sis, ion-exchange, photochemical processing, lo temperature microwave radiation, osm sis/ultrafiltration, and activated carbon adsor tion. (Witt-IPC)
W76-01219

REMOVAL OF PESTICIDES BY REVERSE OS MOSIS,
Illinois Univ. at Urbana-Champaign. Dept. of Civ Engineering.

E. S. K. Chian, W. N. Bruce, and H. H. P. Fang.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-005 591, $3.50 in paper copy, $2.25 in microfiche. Environmental Science and Technology, Vol 9, No 1, p 52-59, January, 1975. 2 fig, 24 ref, 4 tab.

Descriptors: *Pesticides, *Reverse osmosis, Membrane processes, Separation techniques, Pollutants, Water pollution sources, Waste water treatment, Chlorinated hydrocarbon pesticides, Organophosphorus pesticides, Organic pesticides, Water quality control, Membranes, Water pollution treatment.
Identifiers: Cellulose acetate, Polyethylenimine.

Two types of reverse osmosis membranes, i.e., cellulose acetate and cross-linked polyethylenimine (designated NS-100 by the Office of Saline Water), were evaluated for efficiency of removal of a wide variety of pesticides, including chlorinated hydrocarbons, organophosphorus, and miscellaneous pesticides. With each membrane the rejection of pesticides was better than 99%. A considerable amount of pesticide was adsorbed onto the membrane materials. The extent of adsorption is governed by van der Waals-London forces and hydrophobic bonding between pesticide molecules and the polymeric membrane materials. Membrane rejection of the pesticides is in turn governed by the polarity of the solute molecules in aqueous solution, which is in accord with the theory advanced by Sourirajan. (Witt-IPC)
W76-01223

BASICS OF POLLUTION CONTROL.
Gurnham and Associates, Inc., Chicago, Ill.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 512, $4.00 in paper copy, $2.25 in microfiche. Gurnham and Associates, Inc., Chicago, Ill., (1973). 44 p, 1 append.

Descriptors: *Dairy industry, *Water pollution sources, *Pollutant identification, Water pollution, Wastes, Industrial wastes, Wisconsin, Pollutants, Farm wastes, Waste water(Pollution), Surveys, Flow measurement, Analytical techniques, Equipment, Sampling, Water analysis.
Identifiers: Seminars.

This text outlines the technical measurements used by pollution control technologists, as they apply to the dairy industry, and defines the technical terms used in federal, state, and local laws controlling waste water discharges from dairies. Sources of water borne wastes from dairies are listed, and the significance, loadings, and limitations for each and methods of analysis are described. A program for conducting a plant waste water survey, for the purpose of determining specific sources of pollution and measuring the quantities of each, is outlined. The appendix is a paper (by C. F. Gurnham and M. I. Beach) that explains the devices and techniques used for measuring flows and for sampling waste water streams. (Witt-IPC)
W76-01228

BIOLOGICAL TREATMENT OF SHIPBOARD SANITARY WASTE WATER,
Merchant Marine Academy, Kings Point, N.Y.
W. H. Bailey.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-75-10178, December, 1974. 71 p, 16 fig, 33 ref, 13 tab.

Descriptors: *Sewage treatment, *Biological treatment, *Ships, Water pollution sources, Waste water treatment, Water pollution treatment, Water pollution control, Water pollution, Waste treatment, Sewage, Water purification, Domestic wastes, Legislation, Waste disposal, Inland waterways, Sea water, Filters.
Identifiers: *Shipboard sewage treatment, Rotating-Disc Bio-Surf process, Klock submerged filter process.

The biological treatment of shipboard waste water and the pollution problems caused by this waste water are discussed. The study evaluates two of the most efficient biological sanitary waste water treatment systems adaptable for shipboard use, namely, the Rotating Disc Bio-Surf process and the Klock Submerged Filter process. These processes are most advantageous from a cost/benefit point of view, as opposed to purely mechanical/chemical units. The Bio-Surf system consists of a large number of plastic disks, which are mounted on a horizontal shaft and rotated while approximately one-half their surface areas are submerged in the waste water. In rotation, the disks carry a layer of waste water into the air where it trickles down the surface of the disks and absorbs oxygen. In the Klock process, waste water is circulated through the culture-laden growth medium in a baffled tank arrangement making repeated and intimate contact with large portions of the biological material. The biological treatment of wastes, composition of sewage, and regulations covering the disposal of shipboard wastes, and the problem of waste disposal from boats navigating inland waterways are considered. (Witt-IPC)
W76-01229

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SECONDARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01231

EFFICIENCY OF OIL SPILL REMOVERS,
P. Michel.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 900-T, $4.00 in paper copy, $2.25 in microfiche. English translation of Revue des Travaux de Institut des Peches Maritimes, Vol 36, No 1, p 85-102, 1972. 13 fig, 11 ref, 3 tab.

Descriptors: *Oil spills, *Water pollution sources, Disaster, Oil pollution, Water pollution control, Water pollution, Efficiencies, Oil, Translations, Foreign research, Chemical precipitation, Emulsifiers, Surfactants, Europe, Organic compounds, Marine bacteria, Toxicity, Aquatic microorganisms.
Identifiers: France.

The results of a study comparing the efficiency of 3 types of chemicals (emulsifiers, agglomerants, and precipitants) in cleaning up oil spills on water are presented. The study was carried out in the laboratory, using standard methods, in order to obtain accurate and reproducible results. Emulsifiers (based on organic solvents) and surface-active agents convert the oil into a fine emulsion; degradation of the oil by marine bacteria follows. Agglomerants are low-density powders that absorb the hydrocarbons and facilitate their recovery, while precipitants, which are also absorbent powders but heavier than water, cause the oil to settle on the sea bottom. Of the three types of agents, emulsifiers are the easiest to use. They can be used with equal ease on the high seas or in protected areas, on floating oil, or on beaches. Only their toxicity can hamper their use when marine flora and fauna must be protected. (Witt-IPC)
W76-01232

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTEWATER TREATMENT IN AMMONIA PRODUCTION,
Houston Univ., Houston, Tex.
J. A. Calloway, A. K. Schwartz, Jr., and R. G. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 219 $5.00 in paper copy, $2.25 in microfiche. Report NSF-RA-E-74-007, February, 1974. 91 p, 11 fig, 20 ref, 8 tab. NSF GI 34459.

Descriptors: *Ammonia, *Waste water treatment, *Water utilization, *Chemical wastes, Linear programming, Model studies, Water supply, Water resources, Energy, Texas, New Jersey, Michigan, California, Dissolved solids, Suspended solids, Heat, Injection wells, Evaporation, Ultimate disposal, Pollution taxes(Charges), Computer programs, Water consumption(Except consumptive use), Water quality standards, Water quality, Economics, Industrial wastes, Costs.
Identifiers: Zero discharge.

A linear programming model has been developed for evaluating the effects of increasingly restrictive waste water standards and higher costs of water withdrawals on production costs, effluent taxes, water use, and energy use in a representative ammonia plant. Specific cities were chosen to represent regions and the prevailing design parameters applicable to the respective cities were used in model development. The cities chosen include Houston, Texas; Trenton, N.J.; Saginaw, Michigan; and Sacramento, California. The following results were obtained: Zero discharges of suspended soids, heat, and total dissolved solids increased production costs by approximately 1.5% using injection wells for ultimate disposal and 3.2% using evaporative disposal techniques; zero discharges increased energy consumption by approximately 2.7%; higher costs for water withdrawals do not significantly increase production costs; effluent taxes required to achieved zero discharge vary with geographic region, ranging from 20 cents/lb for Saginaw, to 36 cents/lb for Trenton; and a water withdrawal price greater than 50 cents/million gallons is necessary before air cooling becomes feasible in any location. The model applies to new large plants rather than existing facilities. A description of the ammonia production process using both natural gas and naphtha feedstocks is given. (Witt-IPC)
W76-01234

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE CEMENT MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
J. E. Riley.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 610, $5.50 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-005-a, January, 1974. 115 p, 18 fig, 16 tab, 56 ref. 68-01-0599.

Descriptors: *Cements, *Waste water treatment, *Water quality standards, Water pollution treatment, Standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Evaluation, Economics, Effluents, Regulation.

Findings are presented of a study for the purpose of developing effluent limitation guidelines (setting forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and through application of the best available technology economically achievable, which must be achieved by existing plants by July 1, 1977, and July 1, 1983, respectively), standards of performance, and pretreatment standards (setting

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forth the degree of effluent reduction achievable through the application of the best available demonstrated control technology, processes, operating methods or other alternatives) for the industry. Supporting data and rationale for the development of the proposed guidelines cement manufacturing and standards are presented. Manufacturing processes, wastes, and waste treatment processes and their costs are discussed. (Witt-IPC)
W76-01235

EXPERIMENTAL PROTOTYPE OILY WASTE-WATER TREATMENT SYSTEM.
Holt (Ben) Co., Pasadena, Calif.
Available fom the National Technical Information Service, Springfield, Va 22161, as AD/A-004 990, $4.50 in paper copy, $2.25 in microfiche. March, 1974. 63 p, 20 fig, 7 tab. N62399-74-C-0004.

Descriptors: *Oily water, *Waste water treatment, *Treatment facilities, Water pollution sources, Water pollution treatment, Water pollution control, Separation techniques, Activated carbon, Organic compounds, Emulsions, Oil pollution, Water pollution, Oil, Oil wastes, Wastes, Waste treatment, Prototypes, Equipment.

An experimental prototype oily waste water treatment system rated at 20 gpm consists of three stages: a parallel corrugated plate gravity separator, a coalescer with prestrainer and prefilter, and two carbon columns for removing oil from mechanical emulsions in water of varying salinity. The first two stages will normally be employed to remove free and mechanically emulsified oil from the waste water, and the third stage will be employed only when soluble organics are present in the waste stream, or when the second stage is producing an effluent containing more than 10 ppm of hydrocarbon. (Witt-IPC)
W76-01236

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR THE CATFISH, CRAB, SHRIMP AND TUNA SEGMENTS OF THE CANNED AND PRESERVED SEAFOOD PROCESSING INDUSTRY POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01237

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PETROLEUM REFINING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guideines Div.
For primary bibliographic entry see Field 5G.
W76-01238

TREATMENT OF WASTE WATERS FROM A COMBINED SEWER SYSTEM (EGYESITETT RENDSZERU CSATORNAHALOZAT SZENNYVIZEINEK TISZTITASA),
A. Dekei, S. Jakab, and E. Stricker.
Hidrologiai Kozlony, Vol 52, No 11, p 467-476, November 1972. 9 fig, 4 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Combined sewers, Runoff, Activated sludge, Effluents, Aeration, Sludge disposal, Sewage treatment, Anaerobic digestion, Centrifugation, Incineration.
Identifiers: Hungary, Anaerobic fermentation, Dry weather-flow.

Planning and design of a combined sewage and waste water treatment facility for a 12.7 sq km urban watershed in Hungary required a maximum yield of 9 cu m/sec as the recipient has a water yield of 0.55 cu m/sec and the dry weather waste water runoff flows at 0.60 cu m/sec. Mixed sewage water with a maximum yield of 1.5 m/sec will be treated in an activated sludge facility, while the remainder, generated during rainfall periods, will be stored for subsequent purification. Effluents exceeding a yield of 9 cu m/sec will be discharged directly to the receiving body, with the duration of such events not to exceed 3.1 hours per year. The waste water treatment plant, originally designed for a capacity of 30,000 cu m/day, will reduce the BOD5 content from 35--500 to 25 mg/liter. Vertical shaft aerators will be used and the aeration time will be 4.3 hours. The sludge obtained will be concentrated from 5 to 30-35 percent by two-stage anaerobic fermentation over 33 days. Centrifugal dehydration with polymer addition, followed by incineration in a rotary furnace, is one option being considered for sludge destruction. (Sandoski-Firl)
W76-01276

TECHNICAL AND ECONOMIC OPTIMIZATION OF REGIONAL WASTEWATER MANAGEMENT (TECHNISCHE UND WIRTSCHAFTLICHE OPERIMIERUNG BEI DER BILDUNG VON ZWECKVERBAENDEN ZUR ABWASSERBESEITIGUNG),
For primary bibliographic entry see Field 5G.
W76-01277

A SURVEY OF THE MAEBASHI MUNICIPAL SEWAGE TREATMENT PLANT INSTALLATION (MAEBASHI-SHI GESUI SHORIYO NO SHISETSU GAIYO),
S. Nakashima.
Gesuido Kyokai-shi, Vol 10, No 105, p 44-49, February, 1973. 2 fig, 3 tab.

Descriptors: *Treatment facilities, *Waste water treatment, Activated sludge, Aeration, Sewage, Incineration, Settling basins, Chlorination, Sludge disposal.
Identifiers: Maebashi Municipal Sewage Treatment Plant(Japan).

The construction of the Maebashi Municipal Sewage Treatment Plant was started in 1962 and with gradual expansion and remodeling plans due to increased population, was completed in 1972, except for the sludge incineration process. The plant requires further augmentation and remodeling due to increased total area and population beyond the projected estimations. A standard activated sludge process, convertible to the step method using high speed aeration precipitation, and combined sewer drainage can treat 60,786 cu m/day on dry days, and 165,780 cu m/day during rain. The sewage BOD is 200 mg/liter with an elimination rate of 90 percent; suspended solids are 250 mg/liter with 80 percent elimination. The treatment plant comprises a sedimentation pond, the main pump, and the first settling basin. The surface loads are 44.4 and 121.1 cu m/day with settling times of 0.7 and 0.6 hours for dry and wet days respectively. The aeration tank is divided by porous walls into six chambers, with an air stirring device on one side of the wall. Complete mixing and aeration are completed in the six chambers and the sewage is sent to the final settling basin. The median adjustment wall in this basin helps the precipitation of activated sludge. The settling time is two hours after which sewage goes to a chlorine mixing pond. The sludge goes to the treatment plant, is dehydrated by a centrifugal machine, incinerated, and buried. (Sandoski-FIRL)
W76-01278

TREATMENT IN MUNICIPAL PLANTS: INNOVATIONS FOR REMOVAL OF PHOSPHORUS,
Toronto Univ., (Ontario).
P. H. Jones.
Water Research, Vol 7, No 1-2, p 211-226, January/February, 1973. 5 fig, 2 tab, 13 ref.

Descriptors. *Waste water treatment, *Treatment facilities, Activated sludge, Sludge, Phosphorus, Nutrient removal, Chemical oxygen demand
Identifiers: Phosphorus removal, Anaerobic holding, COD removal.

The concept of removing phosphorus from waste water by using a sub-stream within the plant which naturally has phosphorus concentrated considerably above the ambient concentration has been investigated. A continuous laboratory-scale plant was studied, operating under contact stabilization conditions and using an anaerobic holding technique on the return activated sludge; phosphorus was removed from the supernatant of the return sludge stream. The plant was operated with and without the anaerobic holding modification. Both before and after the modification, the organic carbon as measured by COD removal was of the order of 90 percent; after modification of the plant to release the phosphorus from the return sludge stream, phosphorus removals jumped from 10 to 30 percent up to a high of 75 to 90 percent removal. A very slight decrease in sludge activity could be observed due to anaerobic holding, but the very slight reduction in COD removal was more than offset by the increased removal of soluble phosphorus through the supernatant of the return sludge line. (Sandoski-FIRL)
W76-01279

USING INTERMEDIATE STORM-WATER RETENTION TANKS (RUEB) INSTEAD OF RAIN OUTLETS (RUE) AT SUBSEQUENT ENLARGEMENT OF RATE OF FLOW OR OF MIXING RATE (DIE ZWISCHENSCHALTUNG VON REGENUEBER-LAUFBECKEN (RUEB) ANSTELLE VON REGENUEBERLAEUFEN (RUE) BEI NACHTRAEGLICHER VERGROESSERUNG DER WASSERMENGE ODER DES MISCHVERHAELTNISSES),
R. Lautrich.
Wasser und Boden, No 2, p 41-43, 1973. 2 fig, 2 ref.

Descriptors: *Data processing, *Sewage, *Waste water treatment, Storm water, Rainfall, Industrial wastes, Flow.
Identifiers: Retention tanks, Sewage load.

An electronic data processing program providing for the computation of sewage load to the main canal during one rainfall and during one year is presented. Parameters taken into consideration included: in- and out-flow times within one settlement area between a sequence of storm water retention tanks; flow detention; annual precipitation and rainfall frequency; intermittent additional water inflow; distribution of sewage water accumulation satisfying local conditions; industrial waste water inflow dependent on various fluctuations; and the settling effect of the storm water retention tanks as affected by water detention time. In addition, BOD5 computation is included in this program. Results from evaluation indicate that the total annual main canal sewage load can be reduced by applying a series of intermediate retention tanks, sized with the account of different settling times. (Sandoski-FIRL)
W76-01280

THE EFFICIENCY OF IMMERSED TRICKLING FILTER PLANTS IN THE PRACTICE (DIE LEISTUNG VON TAUCHTROPFKOERPERANLAGEN IN DER PRAXIS),
Kh. Krauth, and K. F. Staab.
Gas und Wasserfach, Wasser/Abwasser, Vol 114, No 1, p 34-39, 1973. 5 fig, 9 tab, 4 ref.

Descriptors: *Waste water treatment, *Trickling filters, Investigations, Treatment facilities, Sewage treatment, Digestion tanks.

Information on the procedures and results of a series of 14 investigations conducted during 1969 through 1971 at main collector sewage treatment

plants and house facilities with digestion tanks are detailed. Sewage was sampled proportionally with the water quantity from the intake at the immersed trickling filters and from the drainage. The analysis was carried out for the consumption of KMnO4, BOD5, total phosphorus, total nitrogen, and for the oxidized nitrogen in the drain. The relationship between the surface load and the cleaning rate was studied, and in evaluating the data obtained, the pretreatment of the sewage was taken into consideration to prevent misinterpretation. Data indicate that concentration in a drain of equal or less than 25 mg BOD5/liter can be obtained when the load is equal or less than 10 grams BOD5/sq m per day. Also if 90 percent of all the values cannot exceed a drain concentration of equal or less than 25 mg BOD5/liter, then the surface load cannot exceed 3.0 to 4.0 grams BOD5/sq m xd. (Sandoski-FIRL)
W76-01282

EXPERIMENTAL PROGRAM FOR UNWATERING DIGESTED DOMESTIC SEWAGE SLUDGE UNDER PLANT CONDITIONS (TERV A ROTHASZTOTT VAROSI SZENNYVIZTELEPI SZAP UZEMI VIZTELENTESI KISERLETERE),
For primary bibliographic entry see Field 5E.
W76-01283

WASTE WATER QUANTITIES, TREATMENT AND REMOVAL IN COMMUNITIES AND INDUSTRIES IN THE FEDERAL REPUBLIC OF GERMANY (ABWASSER-ANFALL, BEHANDLING AND BESEITIGUNG IN GEMEINDEN UND INDUSTRIEBETRIEBEN IN DER BRD).
Staedtehygiene, Vol 24, No 1, p 12-15, 1973. 1 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Biological treatment, Cities, Rural areas, Sewage, Sewerage, Population, Industrial wastes.
Identifiers: Germany.

In the Federal Republic of Germany, 17.5 million cubic meters of waste water are drained daily to the public sewer, of which 49.8 percent is domestic and commercial, and 36.9 percent industrial waste water. Prior to discharge, 47.4 percent of the waste water is treated in biological treatment plants and 8.4 percent, undergoes mechanical treatment. Presently, many small communities do not have sewage and/or waste water treatment; in major cities about one third of the waste water quantity is treated biologically and about 40 percent treated mechanically. In the future, the sewer system in the rural regions will be completed, similar to that in cities with more than 100,000 inhabitants in which more than 90 percent of the population is connected to sewers. It is projected that from 1969 to 1985 domestic waste water quantities will increase from 8.7 to 14.7 million cu m/day. This translates to new biological treatment facilities for 9.6 million inhabitants in addition to the mechanical and partly biological treatment plants already planned or in use for 18.1 million people. (Sandoski-FIRL)
W76-01284

KINETIC MODELING OF AERATION BASINS,
Texas Univ. at Austin. Dept. of Chemical Engineering.
F. de Villaret, and D. M. Himmelblau.
Journal Water Pollution Control Federation, Vol 45, No 2, p 292-303, February, 1973. 13 fig, 1 tab, 8 ref.

Descriptors: *Model studies, *Waste water treatment, Aeration, Biological treatment, Treatment facilities, Mathematical models.
Identifiers: Aeration basins, Microbial population.

Aeration basins are widely used in secondary waste water treatment and can usually be represented by some type of mathematical model. This study, concerned with the representation and interpretation of the kinetic portion of models of aeration basins, uses a somewhat different approach to the modeling of the biological reactions in that it accounts for the individual components of the substrate but treats the microbial population as a homogeneous mass. Validity of the proposed treatment has been demonstrated by experimentation in both batch and continuous laboratory aeration tanks. In view of the need for control and analysis in biological waste water treatment plants, it is beneficial that the kinetic coefficients of the process model be obtained from such laboratory systems. When introduced into models of the waste water treatment process together with mixing or dispersion parameters obtained in the plant on the actual equipment, predictions for plant operation and design can be made. The models represent not only steady-state operation but also transient responses caused by changes in plant loading and process upsets. (Sandoski-FIRL)
W76-01286

AERATED LAGOONS PROVIDE EFFECTIVE TERTIARY TREATMENT,
Itasca, Ill.
J. J. Kindermann.
Public Works, Vol 104, No 3, p 97-98, March, 1973. 4 fig.

Descriptors: *Aerated lagoons, *Waste water treatment, *Tertiary treatment, Activated sludge, Sewage, Sludge disposal, Aeration, Biochemical oxygen demand, Flow, Illinois.
Identifiers: Itasca(Ill), Settling tanks, Vacuum filters.

Completed in 1969, aerated lagoons supplement a conventional activated sludge plant in Itasca, Illinois and this arrangement has avoided several potential problems. The city of 5000 has a present average dry-weather flow in the sewer system of about 0.5 mgd. The activated sludge plant consists of four primary settling tanks, two aeration tanks, a final settling tank, and a sludge disposal system consisting of a holding tank and a vacuum filter for dewatering the sludge. Aeration is provided by the valved tubing arrangement laid transversely to form 290 lines, with the distances between lines increasing with distance from the inlet. With air rising laminarily from the tubing, it creates linear 'air screens', separating the lagoons into treatment cells. Four blowers are provided, two rated at 15 hp each to deliver 230 cfm of air at 10 psi, and two rated at 5 hp each to deliver 80 cfm at 9 psi. These are used alternately as 20-hp pairs furnishing 310 cfm. The lagoons were sized to accept a daily BOD loading of 562 pounds. The sides are sloped on a ratio of 1 to 4.17. The retention period at design average flow is 1.9 days. (Sandoski-FIRL)
W76-01287

WATER DECONTAMINATION THROUGH RAIN WATER TREATMENT IN STORM WATER RETENTION TANKS (ENTLASTUNG DER GEWASSER DUCH BEHANDLUNG DES REGENWASSERS IN REGENUEBERLAUFBECKEN),
For primary bibliographic entry see Field 2E.
W76-01289

THE SEWERS OF PARIS (LES EGOUTS DE PARIS),
Paris (France).
M. Ganneau.
Travaux, No 455, p 40-45, February, 1973. 8 fig.

Descriptors: *Sewers, *Treatment facilities, *Sewerage, Siphons, Storm runoff, Combined sewers, Water supply.
Identifiers: Paris, France, Gravity sewers.

Through the sewers of Paris, effluents are channeled by five gravitational collectors, with slopes of 0.20 m/km, into waste treatment plants located in the north and northwest from Paris. When necessary, the collectors are conducted underneath the Seine bed by means of siphons. High storm water runoff loads occurring in the mixed sewage system are leveled off by retention basins. The sewage system also accommodates water supply pipes, telephone and other communication lines. (Sandoski-FIRL)
W76-01293

NEEDS AND PLANS IN THE DEVELOPMENT OF URBAN AND RURAL SEWER SYSTEMS (POTRZEBY I PLANY ROZBUDOWY SIECI KANALIZACYJNEI W MIASTACH I OSIEDLACH),
For primary bibliographic entry see Field 8A.
W76-01294

THE ELIMINATION OF PHOSPHATES AND NITRATES OF WASTE WATER BY ALGAE CULTURES: I (/N FLEMISH),
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Anorganiche Technische Chemie, Elektrotermie en Elektrochemie.
F. M. Bosch, H. Lootens, and E. Van Vaerenberch.
Natuurwet Tijdschr. Vol 54, No 4/5, p 109-116, 1972. Illus. (Engl. summ.).

Descriptors: *Phosphates, *Nitrates, *Waste water disposal, Waste water treatment, *Algae.
Identifiers: Chlorophyll, Cultures.

The removal of P and N by algae is the 3rd step in the purification of waste water. The concentration of P and N and the amount of chlorophyll a, as a measure for the growth of algae, are determined as a function of time.--Copyright 1974, Biological Abstracts, Inc.
W76-01312

FACTORS AFFECTING ADOPTION OF LAND TREATMENT OF MUNICIPAL WASTE WATER,
North Carolina State Univ. at Raleigh. Dept. of Economics and Business.
G. A. Carlson, and C. E. Young.
Water Resources Research, Vol 11, No 5, p 616-620, October 1975. 1 fig, 3 tab, 6 equ, 21 ref.

Descriptors: *Waste water treatment, *Water pollution control, *Regression analysis, Land, Technology, *Economics, Municipal wastes, Data collections, Demand, Prices, Decision making, Probability, Constraints, River flow, Rainfall, Labor, Capital, Irrigation water, Volume, Mathematical models, Systems analysis, Estimating, Equations.
Identifiers: *Land treatment, Nonlinear regression, Demand curve, Empirical analysis, Log linear, Linear model, Federal funding, Byproduct production, Sales.

A demand curve for land treatment of municipal waste water is derived assuming a profit-maximizing framework. The outputs of a waste treatment facility are taken to be volume of waste water, degree of waste removal, and potentially marketable by-product. The demand curve for land treatment is estimated by utilizing data collected from 125 U. S. cities. The dependent variable is adoption or nonadoption of land treatment, and coefficients are estimated by nonlinear regression. The price of byproducts (water), required degree of treatment, price of capital, and local construction cost share all significantly increase adoption. Volume of river flow, rainfall, and volume of effluent flow all have a significant negative effect on adoption. Land prices were insignificant, a factor which is believed to be due to the nonpurchase of land by many land treatment facilities. (Bell-Cornell)
W76-01329

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WATER REUSE: A FLEXIBLE AND EFFICIENT MANAGEMENT ALTERNATIVE FOR MUNICIPAL WATER SUPPLY,
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
D. M. Dworkin.
Water Resources Research, Vol 11, No 5, p 607-615, October 1975. 6 fig, 8 tab, 19 ref.

Descriptors: *Water supply development, *Water reuse, *Simulation analysis, *Water management(Applied), *Alternative planning, Municipal water, Reservoirs, Streamflow, Economics, Economic efficiency, Costs, Effluents, Water utilization, Mathematical models, Systems analysis, Water quality control, Colorado.
Identifiers: *Colorado Springs(Colo), Program expansion.

There is an increased interest in water reuse to supplement present supplies or to be incorporated in future plans, due to the decreasing availability of conventional sources, the better-quality effluent being discharged under stricter pollution control regulations, and the federal legislation requiring the consideration of reuse as an alternative water supply source. Herein, a comparison between the fixed schedule of planned expansion of water supply sources and an alternative expansion program based on a short-term decision from monitoring reservoir levels, water use, and streamflows and employing water reuse capacity and new source development is simulated for the Colorado Springs municipal water system. For this complex, fast growing system with supply based on streamflows and some current reuse capacity, the alternative plan postpones major new development an average of 14 years at a cost at present value of half the original planned expansion; the alternative is more efficient since (1) it would allow demands on the system to rise without increasing conventional capacity and (2) it could substitute for high levels of assurance. A minimum requirement of present planning for renovation or reuse of water is the modification of systems to include a physical cross connection between the two, allowing water to be used interchangebly for nonpotable purposes, and a common management process to make such decisions. (Bell-Cornell)
W76-01330

NOW, NO ODOR WASTE HANDLING,
R. J. Fee.
Successful Farming, Vol 71, No 9, p K14, August, 1973. 2 fig.

Descriptors: *Odor, *Waste treatment, *Hogs, *Farm wastes, Centrifugal pumps, Sewage, Costs, Effluents, *Iowa.
Identifiers: Pits.

A new concept in odorless waste handling for hogs is being used on the Orville Luedtke farm in Iowa. The basic principal of the Rem-Ox system is that its uses atmospheric oxygen to maintain an aerobic condition in the waste for fast, odor free organic material digestion. All waste treatment is done within the building, using centrifugal force, circulating sewage pumps to agitate and aerate the material in the pits. The 'racetrack design' pits in the Luedtke's system can be much more shallow than usual. The centrifugal force sewage pumps are placed at strategic locations to propel the effluent in a circular fashion around the building. Costs depends on the size and type of structure. Sizing of pumps and motors is based primarily on the daily animal manure input into the system. (Cameron-East Central Oklahoma State)
W76-01376

THE HIGH COST OF RUNOFF CONTROLS: IS HELP NEEDED.
The Furrow, p 14-15. March, 1975.

Descriptors: *Costs, *Agricultural runoff, *Control systems, *Feed lots, Livestock, *Cost sharing, Farm wastes, Water pollution control, *Waste treatment.
Identifiers: Rural Economic Assistance Program.

New state and federal laws governing runoff control from feedlots will be costly for all livestock producers and may force the smaller ones out of business. Michigan State University economists estimate that runoff controls would costs from $3.98 to $14.37 per head for feedlots with 1,000 head or more, and they could run higher for smaller operations. USDA economists estimate control costs for northern areas could costs $25 per head for a 150-cow dairy and more for smaller dairies. The USDA approved a cost-sharing program (REAP) in 1973 which enabled a producer to receive up to 80 percent of the total costs for runoff controls with a maximum of $2,500. The $2,500 ceiling on funds provides little relief for the impact of control costs of large feedlot operations; however, large operations can pass these costs on to consumers more easily than smaller operations. Cost sharing programs for 1975 are questionable because there were no cost-sharing programs in 1974. (Battles-East Central Oklahoma State)
W76-01378

THE ANAEROBIC DIGESTION OF WASTE FROM AN INTENSIVE PIG UNIT,
Rowett Research Inst., Bucksburn (Scotland).
P. N. Hobson, and B. G. Shaw.
Water Research, Vol 7, No 3, p 437-449, 1973. 1 fig, 13 tab, 14 ref.

Descriptors: *Anaerobic digestion, *Waste treatment, *Hogs, *Farm wastes.
Identifiers: *Loading rates.

Anaerobic digestion was investigated as a primary treatment for very strong agricultural wastes, to reduce the solids and polluting properties and to improve the settling of the waste in order to give a supernatant liquid which, while not up to river board standards would be suitable for discharge to town sewers, for secondary aerobic or other treatment, or for recycling as animal house washwater. Six experiments were run. Experiments 1 and 2 concerned batch digestion of waste. The experiments showed that a proper digestion, with the primary acidic and secondary methanogenic fermentation in balance, could not be developed by direct incubation of undiluted or almost undiluted, pig waste. Experiment 3 showed that a balanced digestion of piggery waste could be obtained using a seed of digesting sewage, but that loading rate in the early stages of the digestion could be a critical factor. Experiment 4 showed that a balanced digestion of piggery waste could be achieved without a seed if the initial loading rate was low enough to allow a methanogenic flora to develop before a high acid concentration was reached. Experiments 5 and 6 dealt with performance of initially seeded and unseeded digestions at different loading rates. These two experiments revealed that balanced digestion could be obtained by using, initially, low loading rates and allowing time for the build-up of a stable population of the correct bacteria. (Cartmell-East Central Oklahoma State)
W76-01379

THERMOPHILIC BACTERIAL OXIDATION OF HIGHLY CONCENTRATED SUBSTRATES,
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.
F. Popel, and C. H. Ohnmacht.
Water Research, Vol 6, p 807-815, 1972. 6 fig, 3 tab, 9 ref.

Descriptors: *Thermophilic bacteria, *Farm wastes, *Oxidation, Aerobic bacteria, Sewage sludge, *Waste treatment.
Identifiers: Mesophilic bacteria, Pasteurization, Substrates.

Disposal of substrates with high amounts of pathogenic bacteria and oxidizable organic matter can be accomplished without polluting resources after proper stabilization, pasteurization and deodorization. This is accomplished by heating them long enough to degrade the pathogenic bacteria and organic matter. The heat is provided by exothermic reactions in aeration tanks to which the sludge has been added. The sludge must be continually recirculated to aid mesophilic and/or thermophilic bacteria and to provide an oxygen balance in the circulating liquid. Exothermic reactions heat the substrates up to 65-70 degrees centigrade which accelerates the rate of degradation of the organic matter and pasteurization of the substrates. Also large quantities of humus compounds are produced during the oxidation. This process can be used on highly concentrated substrates with a high BOD5 such as sewage sludge, liquid manure from animals, or industrial waste. (Russell-East Central Oklahoma State)
W76-01380

TROUT METABOLISM CHARACTERISTICS AND THE RATIONAL DESIGN OF NITRIFICATION FACILITIES FOR WATER REUSE IN HATCHERIES,
Texas Univ. at Austin. Dept. of Civil Engineering.
R. E. Speece.
Transactions of the American Fisheries Society, Vol 102, No 2, p 323-334, April 1973. 14 fig, 12 ref.

Descriptors: *Trout, *Metabolism, Data collections, *Nitrification, *Water reuse, *Fish hatcheries, Oxygen requirements, Ammonia, Suspended solids, Temperature, Feeding rates, Biochemical oxygen demand, Water pollution effects, Treatment facilities.
Identifiers: Nomograph.

An attempt is made to bring together the available information on trout metabolism and nitrification with the objective of establishing a rational procedure for the design of nitrification facilities for water reuse in trout hatcheries. The same rationale can be used for other types of fish through the use of the appropriate ammonia production, oxygen requirement, and water requirement data. Data have been taken from the literature on trout culture to mathematically define the ammonia production, oxygen requirements, BOD and SS production, water requirements, and loading rates as a function of trout length and water temperature. The temperature dependence of feeding rate and nitrification capacity has been incorporated into a nomograph which predicts the nitrification volume requirements for recycling. Another nomograph was constructed to predict water flow requirements and pollution resulting from trout hatchery operation. (Cartmell-East Central Oklahoma State)
W76-01382

CONFINEMENT LIVESTOCK FACILITIES WASTE MANAGEMENT CODE OF PRACTICE.
Alberta Environment. Edmonton, Alberta, Canada, September 1973, 31 p, 7 fig, 4 tab.

Descriptors: *Canada, *Confinement pens, *Farm management, Design, Odor, Livestock, Farm wastes, Treatment facilities, Waste treatment.
Identifiers: Isolation distances, Waste handling, Land application, Alberta.

Public concern about all forms of pollution of the environment is growing while intensive livestock operations are increasing in number and size. The number of residential dwellings on or near farmland is increasing. Developers of non-agricultural activities in agricultural areas should be aware that complete odor control is beyond present technical capabilities. These guidelines stress that when conflicts result from encroachment on agricultural areas, much of the responsibility should be accepted by the developers and not only the agricultural operator. Guidelines for confinement livestock facilities waste management intend to provide a technical base upon which livestock

peration can develop without causing undue en-ironmental impact. Administration and defini-ons regarding the guidelines are given. The iidelines are defined in terms of developments quiring compliance and the isolation distances. he various components of design guidelines for vestock facilities are listed and examined. The mponents include manure storage, earthen itch basins (and alternate methods), walled orage, storage lagoons and mechanically aerated stems. The guidelines for animal waste manage-ent, including the handling of solid and liquid anure, are discussed. Land application is also ex-nined. Directions for the procedure for using the de are given. (Kehl-East Central Oklahoma tate)
76-01386

GRICULTURAL WASTES, (LITERATURE EVIEW),
ississippi State Univ., State College.
. C. McGriff, Jr., and A. Shindala.
urnal Water Pollution Control Federation, Vol , No 6, p 1167-1173, June, 1973. 63 ref.

escriptors: *Reviews, *Bibliographies, *Farm astes, *Livestock, Chemical properties, Physical roperties, Waste treatment, Lagoons, Fuels, ecycling, Waste disposal, Methane, Feeds, Legal pects, Regulation, Permits.
entifiers: Land disposal, Pyrolysis.

his review of data from many investigators con-rns waste characteristics, pollution abatement ractices, waste use and reuse, and waste manage-ent and legal action. Specific investigations are ted. (Frantz-East Central Oklahoma State)
76-01390

CEAN OUTFALLS AND OTHER METHODS F TREATED WASTE-WATER DISPOSAL IN OUTHEAST FLORIDA, (ENVIRONMENTAL MPACT STATEMENT).
nvironmental Protection Agency, Atlanta, Ga. egion IV.
vailable from National Technical Information ervice, Springfield, Va 22161 as EIS-FL-73-0491-I, $18.75 in paper copy, $2.25 in microfiche. arch, 1973. 745 p, 47 fig, 106 tab.

escriptors: *Human diseases, *Sewage disposal, Sewage bacteria, *Environmental effects, Reefs, ewage effluents, Schools(Fish), Waste ater(Pollution), Water management(Applied), urrents(Water), Discharge(Water), In-ts(Waterways), Algae, Recreation, Bottom sedi-ents, Chemical degradation, *Florida.
entifiers: *Environmental impact statements, Mangrove swamps, Gulf Stream.

he project, an ocean outfall of secondarily eated sewage into the ocean off Southeast orida, calls for a 50 mgd outflow of sewage into e Gulf Stream which would probably be insuffi-ent to disperse the materials from Florida aches or dilute them to insignificant levels. otential negative effects of continued presence of trients, viruses and poisons present in the ef-ent include the danger to public health of re-dents of Palm Beach, Broward, and Dade Coun-s, primarily through direct viral infection and duced availability of uncontaminated fresh ater. Commercial and recreational use of the fshore waters might be reduced due to fish kills, increase in presence of blue-green algae which ers coral reef vitality, damage to fishing and urist interests due to poisoned shellfish, shrimp d fish caught near outflows, as well as increases mangrove swamp pests. The Environmental otection Agency (EPA) and the governments of est Palm Beach and other local communities pport the proposals as safe techniques affording e best available technical solution to segage sposal. A second related group recognizes the ngers of ocean outfall but continues to prefer it a solution. Environmentalists, academic representatives and professional consultants tend to form a third group, which proposes alternatives to the ocean outfall in order to recover highly purified fresh water, safeguard resident health and minimize damage to ocean inhabitants, sport and commercial fishing and recreation. (Knocke-Florida)
W76-01413

REUSE OF EFFLUENT FOR AGRICULTURAL PURPO
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
P. Jakobsen, and R. Wetselaar.
Water (Journal of the Australian Water and Wastewater Association) Vol 2, No 2, p 10-16, June 1975. 3 tab, 59 ref.

Descriptors: *Water reuse, *Irrigation water, *Water quality, *Metals, Nutrients, Salinity, Industrial wastes, Effluents, Toxicity, Pesticides, Detergents, Soil contamination, Reviews.

The more fundamental aspects of the quality of effluent and its effects on agricultural systems are reviewed, with particular reference to its metal content. The implications of the chemical characteristics of major and minor nutrients, non-essential elements, pesticides and detergents are discussed in relation to potential occurrences of excesses following irrigation with industrial waste water. Associated potential hazards of salinity and pathogenic organisms are also considered. (CSIRO)
W76-01416

POLLUTION OF RECIPIENTS BY STORM RUNOFF IN MIXED SEWER SYSTEMS: STORM RETENTION BASINS AS A REMEDY (LA POLLUTION DES EMISSAIRES PAR LES DEVERSEMENTS DES RESEAUX UNITARIES: UN REMEDE LES BASSINS D'ORAGE),
Y. Carre.
Techniques et Sciences Municipales--LEau, Vol 70, No 7, p 313-317, July, 1975. 7 fig, 6 tab, 14 ref.

Descriptors: *Storm runoff, *Sewerage, *Retention, Biological treatment, Waste water treatment, Water pollution sources, Biochemical oxygen demand, Water pollution control, Rain water, Combined sewers.
Identifiers: Retention basins, Baden-Wuerttemberg(Germany).

A method for the control of the pollution of recipients by storm runoff in combined sewer systems in Baden-Wuerttemberg, Germany, is discussed. The BOD content and the pollutant load were measured. It was determined that the storm runoff, especially that discharged during the initial phase of rain, is often as polluted as the effluents that occur during dry weather. Therefore, retention of the initial runoff in retention basins for subsequent biological in-plant treatment is necessary. Storm runoff retention basins have been designed to retain 90% of the annual BOD5 content in the Baden-Wuerttemberg area. (Takacs-FIRL)
W76-01427

HOW MANY WASTEWATER TREATMENT PLANTS ARE NECESSARY IN REGIONAL SEWER SYSTEMS. (HANY SZENNYVIZTISZTITO TELEP LEGYEN A REGIONALIS CAATORNAERNDSZEBEN).
A. Toth, and L. Bulkai.
Hidrologiai Kozlony, Vol 55, No 4, p 164-167, April, 1975. 1 fig, 1 tab.

Descriptors: Sewerage, *Waste water treatment, *Treatment facilities, Regional development, Costs, Biological treatment, Waste disposal, Irrigation, Lakes.
Identifiers: Lake Balaton(Hungary), Sewer pipes.

Economic and technological optimization of regional sewer systems and waste water treatment plants is described, based on optimization calculations for the regional sewer system planned for Lake Balaton in Hungary. The costs of regional sewer systems are composed of sewer and treatment plant costs. Increasing the number of waste water treatment plants in regional systems reduces the cost of the sewer system, as it becomes possible to reduce the diameter of the long-distance sewer pipes. The specific costs per cubic meter of treated waste water depend primarily upon the required degree of purification. Optimization calculations revealed the need for five mechanical waste water treatment plants for the Lake Balaton regional system when using the waste water for irrigation after settling for two hours. This optimum may be reduced to two to three plants if biological treatment is applied before discharge into recipients. One or two large-capacity treatment plants with three steps will be required for purification if the purified water is to be discharged into the lake. (Takacs-FIRL)
W76-01429

WET OXIDATION DISPOSAL OF WASTE MATTER IN SUSPENSION.
For primary bibliographic entry see Field 5E.
W76-01430

SEWAGE AERATION TURBINE.
South African Patent ZA 7305-730. Issued February 21, 1975. Derwent French Patents Abstracts, Vol W, No 22, p D1, July, 1975.

Descriptors: *Patents, *Aeration, *Sewage treatment, Equipment, *Waste water treatment.
Identifiers: *Aeration turbine.

A sewage aeration turbine has been patented. The device consists of an axial flow impeller, designed to rotate below the surface of a liquid body; and a drive mechanism coupled to the impeller to rotate it. The impeller includes several radially extending propeller blades. At least some of these are hollow and have one or more openings which permit the passage of gas into the liquid from the interior of the hollow blades. Equipment located above the liquid surface communicates with the interior of the hollow blades to deliver the gas. Thus, the gas flows out the openings in the blades as the blades rotate to impel the liquid. (Kramer-FIRL)
W76-01431

POLLUTED WASTE WATER PURIFICATION.
Soviet Patent SU 437719. Issued January 3, 1975. Soviet Inventions Illustrated, Vol W, No 24, p D1-D2, July 22, 1975.

Descriptors: **Patents, *Waste water treatment, *Biological treatment, *Sewage treatment, Aeration, Tanks, Reservoirs, Water reuse.
Identifiers: Municipal-industrial wastes.

A patent was issued for a method of waste water purification in which only the most contaminated part of the effluent is treated. Surface waste water from populated and industrial areas was collected. The water received during the first 20 to 30 minutes (the most heavily contaminated) was separated for biological treatment with municipal sewage in an aeration tank. The remaining water was aerated in a periodically emptied tank. In one case, the initial amount of waste water was allowed to settle before being mixed with municipal water for biological purification. The remaining collected surface waste water was aerated in the presence of activator or treated waste water from the first portion. Following disinfection, the water could be reused for industrial or domestic purposes. (Kramer-FIRL)
W76-01432

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PROCESS AND APPARATUS FOR TREATING WASTES BY A COMBINED ACTIVATED SLUDGE AND BIOLOGICAL FILTER BED,
J. Tymoszczuk.
Canadian Patent 972,877. Issued August 12, 1975. Patent Office Record, Vol 103, No 32, p 84, August, 1975.

Descriptors: *Patents, *Activated sludge, *Filters, *Waste water treatment, Sewage treatment, Biological treatment, Equipment, Filtration.
Identifiers: *Biological filters.

A patent has been granted to a process and equipment for treating wastes by a combined activated sludge and biological filter bed. Sewage is treated in a tank containing the means to maintain a submerged biological filter bed zone containing finely divided, particulate filter media. The tank further contains equipment to maintain an activated sludge zone in the tank in an upstream fluid flow relationship to the submerged biological filter bed zone. Baffles divide the tank into several compartments. These baffles extend through the activated sludge zone and partially into the biological filter bed zone. When the apparatus is in use, the finely divided particulate filter media can be recirculated and backwashed and the activated sludge zone aerated. Sewage is fed into the first compartment and treated effluent is removed from the activated sludge zone of the last compartment. (Kramer-FIRL)
W76-01433

CONTINUOUS FILTRATION APPARATUS FOR SEWAGE.
French Patent FR 2247-270. Issued June 13, 1975. Derwent French Patents Abstracts, Vol W, No 29, p D2-D3, August, 1975.

Descriptors: *Patents, *Filtration, *Sewage treatment, Tanks, *Waste water treatment, Pumps, Equipment, Filters, Separation techniques.
Identifiers: Continuous filtration.

A cylindrical filter tank, covered with a filtering fabric, is arranged in a reservoir. In this patented method, sewage enters the chamber of the reservoir through an inlet pipe. A cylindrical supporting plate surrounds the filtration tank, and another cylindrical support plate is arranged inside the chamber. Sewage water flows up the passage and through the filter into the space. Air enters through openings and generates a flow of bubbles; this produces a pressure difference between the fluid containing bubbles and the fluid without bubbles. The pressure difference removes the solid matter adhering to the filtering fabric and prevents clogging. An overflow pipe then receives the filtered water. Any small particles which pass through the filter are evacuated from the conical portion by an air pump. Concentrated solid matter and residue from the sewage is evacuated for further treatment. Because the flow of bubbles prevents any blocking of the filter fabric, removal of the suspended solid matter is efficient and continuous filtration is possible. (Kramer-FIRL)
W76-01434

WASTE WATER AND SEWAGE PURIFICATION APPARATUS.
Belgian Patent BE 825-764. Issued June 16, 1975. Derwent Belgian Patents Report, Vol W, No 28, p D3, August. 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Activated sludge, Biological treatment, Aeration, Sedimentation.
Identifiers: *Chemical treatment.

An apparatus for treating waste water and sewage which can be installed inside an aeration tank was patented. It operates either by the activated sludge process or by chemical purification with air or an oxidizing gas. A flat supporting surface carries the air feeding device and a discharge gutter. The latter is parallel or vertical with respect to the support, depending upon whether the shape of the tank is rectangular or cylindrical. The air feed consists of an extensible tube provided with porous aerators. Air is received which sufficiently aerates the contents of an activation zone and recycles any settled sludge out of a reclarification zone. At the same time, floating sludge is evacuated from the surface of the latter zone. The gutter has a terminal oblique plate, which is swept by the air leaving the inlet device so that a suction effect is created to draw the floating sludge from the reclarification zone to the activation zone. This equipment is particularly suitable for small sewage treatment plants with tanks made of metal, plastic, asbestos cement, or concrete. (Kramer-FIRL)
W76-01435

THE UNOX PROCESS--AN EXTENSIVE EXPERIMENT FOR THE BIOLOGICAL PURIFICATION WITH PURE OXYGEN-- MUNICIPAL WATER PURIFICATION MUNICH (DAS UNOX VERFAHREN--EIN GROSSVERSUCH ZUR BIOLOGISCHEN ABWASSERREINIGUNG MIT REINEM SAUERSTOFF--STADWAESSERUNG MUENCHEN),
P. Martin, H. Schoenfelder, and W. Tischer.
Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 6, p 272-277, 1975. 7 fig, 1 tab.

Descriptors: *Biological treatment, *Waste water treatment, *Municipal wastes, Industrial wastes, Effluents, Oxygen.
Identifiers: *High purity oxygen, *UNOX, Municipal-industrial wastes.

Extensive experiments with the UNOX system developed by Union Carbide for biological waste water treatment are described. The waste water used for the experiments was comprised of 60% domestic effluents with 40% effluents generated in food processing industries. The UNOX system is composed of closed reactors arranged in four stages, in which biological purification is achieved by the admission of air containing at least 95% oxygen. The purified effluent was of better quality than similar effluents treated by conventional methods for the same time period. The process was noted for its high stability with respect to load fluctuations, and a reduced production of excess sludge and solid matter. The UNOX system also offers hygienic advantages due to a reduction in air pollutant emissions. (Takacs-FIRL)
W76-01436

DEVELOPMENT OF THE DEEP AERATION TANK, (IN JAPANESE),
H. K. Fujii, K. Terasawa, I. Naito, and T. Takeshima.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol 12, No 133, p 43-52, June, 1975. 6 fig, 6 tab, 6 ref.

Descriptors: *Aeration, *Tanks, *Suspended solids, *Waste water treatment, Gas chromatography, Activated sludge, Flotation.
Identifiers: *Deep aeration tanks.

A deep aeration tank with an aeration depth of 18 m was compared with one having an aeration depth of 4.2 m. An inner 1.0 m in diameter was used for liquid circulation for the latter case utilizing an air lift effect. The post aeration tanks consisted of four basins having an aeration depth of 4.5 m (water depth 5 m). Mixed liquid was sampled in glass cylinders after one hour of aeration and the liquid was allowed to stand for various periods of time. At an aeration depth of 4.2 m, the activated sludge in the mixed liquid settled almost completely after 30 minutes while at an aeration depth of 18 m, the activated floated during the same period of time. The rate of flotation depended upon the quantities of activated sludge and air. Gases adsorbed on the floating sludge were analyzed by gas chromatography with a thermal conductivity detector. The gases contained up to 94% nitrogen. Good results were obtained at an aeration depth of 4.2 m for a BOD load of up to 100 kg/100 kg suspended solids per day. (Su-FIRL)
W76-01437

DEVELOPMENT AND USE OF FLOATING FILTERING MATERIALS IN WATER FILTRATION (RAZRABOTKA I VNEDRENIE PLAVAYUSHCHIKH ZAGRUZOK FIL'TROVANIYA VODY),
For primary bibliographic entry see Field 5F.
W76-01438

CENTRIFUGING PLANT IN THE PURIFICATION PLANT MUNICH-GROSSLAPPEN (ZENTRIFUGENLAGE IM KLAERWERK MUENCHEN-GROSSLAPPEN),
W. Tischer.
Abwassertechnik, Vol 26, No 3, p 23-24, 1975. 1 fig, 1 tab

Descriptors: *Centrifugation, *Dewatering, *Sludge treatment, *Waste water treatment, Treatment facilities, Polymers, Flocculation, Sludge disposal, Waste disposal.
Identifiers: Munich(Germany)

Full-scale experiments with a large-capacity Klioeckner-Humboldt-Deutz centrifuge used for sludge dewatering at the Grosslappen waste water treatment plant near Munich, Germany, are described. The existing digestors cannot cope with the 200 tons of primary and secondary sludge that are being generated daily. The demand for agricultural use of the sludge has decreased and the use of centrifuges for dewatering is a viable alternative to land application. With centrifugation, the dry matter content is increased from 3-10% to 20-30%. The water separated has a BOD5 level of 100-300 mg/liter. Flocculating polymers may be added directly into the centriguge. (Takacs-FIRL)
W76-01439

PURIFICATION OF URBAN WASTEWATERS BY ALKALINE PHYSICO-CHEMICAL TREATMENT (L'EPURATION DES EAUX RESIDUAIRES URBAINES PAR TRAITEMENT PHYSICO-CHIMIQUE ALCALIN),
D. Alexandre.
Techniques et Sciences Municipales--L'Eau, No 6, p 239-247, 1975. 1 fig, 11 tab, 6 ref.

Descriptors: *Waste water treatment, *Municipal wastes, Flocculation, Biochemical oxygen demand, Chemical oxygen demand, Operating costs, Capital costs, Waste disposal.
Identifiers: *Physico-chemical treatment, Aluminum sulfate, Ferric chloride, Slaked lime, Polyacrylamide A22, Land application.

Alkaline physico-chemical waste water treatment and its advantages are described. Flocculation and subsequent clarification can be used as an autonomous process in place of biological waste water treatment. Flocculation is conducted at a pH of 11.5 in the presence of ferric chloride, aluminum sulfate, slaked lime, or polyelectrolytes. Aluminum sulfate, ferric chloride, slaked lime, polyacrylamide A22 (Purifloc), and powdered activated charcoal Acticarbone TE are used at rates of 20 g/liter, 10 g/liter, 35 g/liter, one g/liter, and 1 g/liter, respectively. The floccules obtained can be easily separated by decantation, and the dense sludge obtained can be disposed of onto landfills. The physico-chemical method is not inferior to biological methods in terms of BOD and COD reduction, and is even superior to the latter regarding disinfection and phosphate elimination. Physico- chemical treatment, requiring lower investment but higher operating costs than a biological system offers the advantage of increased insensitivity to seasonal climatic and load variations. (Takacs-FIRL
W76-01440

EWAGE LAGOONS FOR FINAL TREATENT, EXEMPLIFIED BY BAD HARZBURG
NACHLAERTEICHE ZUR WEITERGEHENEN ABWASSERREINIGUNG-DARGESTELLT M BEISPIEL BAD HARZBURG),
. Zander.
Vasser und Boden, Vol 27, No 5, p 119-121, May, 975. 2 fig, 2 tab, 3 ref.

escriptors: *Lagoons, *Sewage treatment, Biological treatment, *Waste water treatment, hemical oxygen demand, Biochemical oxygen emand.
lentifiers: Post-treatment lagoons, Sewage load uctuations, Seasonal variations, Germany.

perating experiences with sewage lagoons folwing biological waste water treatment at a facili in Bad Harzburg, West Germany, are resented. Four series-connected post-treatment goons with a total surface area of 23,000 sq m are ecessary to handle wide fluctuations in the wage load, which are a result of snowwater inux in the winter and an increase in the seasonal sitor population in the summer months. Water epth is adjustable between zero and 100 cm, and wage has a residence time of one day in each goon. The lagoons were found to increase the efciency of the entire biological waste water treatent plant from 97% in terms of BOD5 reduction. otassium permanganate demand decreased from to 48 mg/liter through the consecutive lagoons. OD values showed a reduction from 39 to 23 g/liter, corresponding to a 40% reduction. The fficiency of the post-treatment lagoons in terms nitrogen and phosphorus elimination amounted 17% and 10%, respectively. The coli titer was duced by 99%, and the lagoons had a healthy sh population. (Takacs-FIRL)
76-01441

XPERIENCE WITH THE DETERMINATION F THE BIOCHEMICAL OXYGEN DEMAND ITH SPECIAL CONSIDERATION OF THE ODIFIED 'VIEHL DILUTION METHOD, ERFAHRUNGEN MIT DER BESTIMMUNG ES BIOCHEMISCHEN SAUERSTOFFEBEARFS UNTER BESONDERER ERUECKSIGHTIGUNG DER MODIFIZIEREN VIEHL 'SCHEN VERDUENNUNGMETHODE),
Boehmke.
as Papier, Vol 29, No 8, p 358-362, August, 1975. fig, 1 tab, 18 ref.

escriptors: *Biochemical oxygen demand, Waste water treatment, *Analytical techniques, icroorganisms, Oxygen, *Pollutant identificaon.
lentifiers: *Viehl's Method.

n improved variation of Viehl's method for the etermination of the biochemical oxygen demand OD) in waste waters is described. A water sam e which contains adapted microorganisms and trient salts is enriched with oxygen to a concenation of 20 mg/liter rather than to 35 mg/liter. A trification inhibitor (N-allylthiourea) is added at rate of 0.6 mg/liter. The determination and calcuion are simplified by the use of a special 100 ml ask. Frequently occuring errors that result from e dilution effect can be avoided if the oxygen nsumption used for the BOD calculation is tween 30 and 70% of the original oxygen conent. (Takacs-FIRL)
76-01442

OMPARATIVE STUDY OF POLIOVIRUS ONCENTRATION METHODS FROM WATER SSAIS COMPARATIVES DE METHODES DE ONCENTRATION DU POLIOVIRUS APARTIR ES EAUX),
Gulian, M. N. Mallet, A Blancard, and J. harrel.
echniques et Sciences Municipales--L'Eau, No p 205-208, May, 1975. 4 tab, 8 ref.

Descriptors: *Pollutant identification, *Filtration, Viruses, Organic matter, Hydrogen ion concentration, Polyelectrolytes, Separation techniques, *Waste water treatment.
Identifiers: *Poliovirus.

Two methods for the separation of poliovirus from different waste were studied. Filtration through a cellulose filter showed efficiencies of over 90% for waste waters with low organic matter content. However, very low efficiency was achieved for waste waters with a high content of organic substances. Adsorption of a polyelectrolyte PE 60 (polystyrene-divinylbenzene with an sobutylene maleic anhydride group) proved to be highly effective with efficiencies between 90 and 100% regardless of the organic matter content of the waste water. However, this method requires a pH value of 5.2. Slight deviations from this pH value result in considerable reduction of the separation efficiency. (Takacs-FIRL)
W76-01444

THE MEASUREMENT OF MLSS USING INTEGRATED SPHERICAL TYPE TURBIDIMETER, (IN JAPANESE),
For primary bibliographic entry see Field 5A.
W76-01445

PHOSPHATE DEPENDENT FLOCCULANT DOSAGE AT PHOSPHORUS ELIMINATION FROM COMMUNAL WASTE WATER (DIE PHOSPHATFRACHT-ABHAENGIGE FAELIMITTEL-DOSIERUNG BEI DER PHOSPHOR-ELIMINATION AUS KOMMUNALEM ABWASSER),
H. Zerres, and R. Wagner.
Chemie Ingenieur Technik, Vol 47, No 13, p 562-565, 1975. 5 fig, 4 ref.

Descriptors: *Flocculation, *Phosphates, *Waste water treatment, *Nutrient removal, Measurement, Flow, Treatment facilities, Photometry. *Pollutant identification.
Identifiers: Flocculant dosage, Phosphate removal.

A method for determining phosphate load-dependent dosage of flocculants for phosphorus removal from municipal waste water is described. The dosage is dependent on the fluctuations in the phosphate load of the waste water. This method is based upon the continuous photometric measurement of the phosphorus concentration in the waste water by a molybdate-vanadate method, and on the measurement of the waste water flow. The signal obtained is used to control the rotation speed of the flocculant proportioning unit, and thus to determine the actual phosphate load. This method has been successfully tested a a waste water treatment plant. (Takacs-FIRL)
W76-01446

STUDY OF THE RELATIONSHIP BETWEEN EFFICACY OF PURIFICATION AND CONSTRUCTION AND OPERATING COSTS OF PURIFICATION PLANTS (UNTERSUCHUNG UEBER DIE BEZIEHUNG ZWISCHEN RENINGUNGSGRAD UND BAU UND BETRIEBSKOSTEN VON KALERANLAGEN),
G. Heberling, and H. Hahn.
Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 5, p 206-208, May, 1975. 5 fig, 14 ref.

Descriptors: *Waste water treatment, *Operating costs, *Construction costs, *Treatment facilities, Mathematical models, Biochemical oxygen demand, Regression analysis.
Identifiers: *Germany.

Correlations between waste water purification efficiency and the construction and operating costs of waste water treatment plants were investigated. Regression analysis was performed on the basis of data from 179 waste water treatment plants put into operation between 1955 and 1972 in West Germany and elsewhere. The regression analysis showed no significant correlation between predetermined purification efficiency goal and the construction and operating costs for new waste water treatment plants. However, a close correlation was found between the expenditures and the population equivalents to be connected to the waste water treatment plant. This correlation, in conjunction with the finding that 84% of the waste water treatment plants reached BOD5 elimination efficiencies over 80%, permits the establishment of universally applicable mathematical models. (Takacs-FIRL)
W76-01448

THE FORECASTING, OF INFLOW VARIATION INTO THE WASTE WATER TREATMENT FACILITY IN THE NEW TOWN, (IN JAPANESE),
M. Hiraoka, T. Murakami, O. Yamamoto, and Y. Horii.
Yosui to Haisui, (Journal of Water and Waste), Vol 17, No 7, p 849-853, 1975. 8 fig, 5 tab, 4 ref.

Descriptors: *Waste water treatment, *Treatment facilities, Water supply, Inflow, Mathematical models, Flow, Forecasting.
Identifiers: *Japan, Inflow variation, Regional forecasting.

Variation of inflow of waste water to a treatment plant at Izumi Kita, Japan, was forecasted by a regional system. The relationship between water supply and waste water was investigated in order to control the waste water variation by water supply variation. Water supply and waste water showed a similar daily flow pattern; waste water had its daily peaks at 9-10 am and after 10 pm. Variation of water supply was extremely broad with a maximum supply of 2,000-2,500 cu m/h and a minimum of 200 cu m/h. Except for one case, water supply flow was considerably higher than waste water. This was due to the conservation in the activity system and transfer to outside of the regional system. Results of investigating the correlation coefficient between water supply variation and waste water variation suggested effective forecasting of inflow waste water variation by water supply variation corresponding to a lag time of about one hour. (Su-FIRL)
W76-01449

EVOLUTION OF OPERATION CONTROL IN WATER TREATMENT (A VIZTISZTITASI TECHNOLOGIAK UZEMIRANYITASANAK FEJLODESE),
J. Kerese.
Hidrologiai Kozlony, Vol 55, No 6, p 266-272, June, 1975. 3 fig.

Descriptors: *Waste water treatment, *Water treatment, *Computers, *Control systems, *Automation, Filters, Data collection.
Identifiers: Hungary, Melyepterv.

Automatic control systems for water treatment in Hungary, under the auspices of the Melyepterv Corporation, are outlined. Equipment is used to process the signals given and to measure data for the control of the flushing of closed drum filters, the backwashing and filter operation of open and closed sand filters, and the rate of chemical feed combined with automatic tank switchover and actuated by flow rates. Pumping stations have been equipPed with constant and variable speed pumps to deliver raw and treated water. Methods adapted for data collection, display, and recording at a central control station are detailed, along with the capabilities of the decision unit and its relationships to the control technology. (Kramer-FIRL)
W76-01450

MATHEMATICAL MODEL OF WATER CHARACTERISTICS IN THE SEWAGE TREAT-

LIBRARY U. OF I. URBANA-CHAMPAIGN

MENT PLANT (GESUI SHORIJO NI OKERU SUISHITSU TOKUSEI NO SUSHIKI MODEL),
T. Kuzuoka, and O. Hitomi.
Kemikaru Enjiniyaringu, (Chemical Engineering), Vol 20, No 6, p 32-38, June, 1975. 7 fig, 2 tab, 19 ref.

Descriptors: *Mathematical models, *Sewage treatment, *Activated sludge, Aeration, Microorganisms, Water quality control, Suspended solids, Treatment facilities, Flow rates.
Identifiers: Material balance equations, Voshel equation.

Mathematical models for sewage treatment by an activated sludge method are illustrated. The method generally consists of initial sedimentation, aeration, and final sedimentation. Water quality from the initial sedimentation can be obtained by a simple Voshel equation. For an aeration basin, water quality is obtained by resolving material balance equations involving flow rates and reactivity of water, microorganisms, substrate, and the variations in microorganism activity. Corrections of equations by using a parameter for the decreasing rate of microorganisms cultivated in synethic sewage water were found suitable for most available equations for the aeration process. Water quality can be kept at a stable level by allowing microorganisms to remain in ther aeration tank for a constant period of time. Two equations used to calculate suspended solids values for the final sedimentation tanks at two water treatment plants from 1966 to 1969 gave satisfactory results. (Su-FIRL)
W76-01451

CONTROL OF THE POLLUTION OF SURFACE WATER BODIES (BESTRIJDING VERONTREININGING OPPERVLAKTEWATER),
J. G. Wedorp.
Procestechniek, Vol 30, No 14, p 454-456, July, 1975.

Descriptors: *Water pollution control, *Public health, *Turbidity, Color, Odor, Surface waters, Aquatic life, Water treatment, Treatment facilities, Waste water treatment, Sewers, Sewerage, Water treatment(Applied).
Identifiers: *Netherlands.

The water pollution control program elaborated by the Ministry of Transportation and Water Management and the Ministry of Public Health and Environmental Hygiene of the Netherlands for the 1975 to 1979 period is presented. The waste water treatment capacity is to be increased to 20,000,000 population equivalents by the construction of 118 waste water treatment facilities and by the expansion of 58 existing ones. The percentage of household not connected to sewer systems will be reduced to 8%. Absence of odor, color, and turbidity are the minimum requirements for the water quality to be achieved within the five-year period. Also, any surface water body should be made suitable as a living environment for aerobic organisms, including fish. Water treatment fees to be paid will be determined as a function of transportation distance, capacity of the water treatment facility, soil conditions, and population density. (Takacs-FIRL)
W76-01452

FORCE MAIN RUNS OBSTACLE COURSE.
Public Works, Vol 106, No 9, p 117, September, 1975.

Descriptors: *Sewerage, *Sewers, Tunneling, Pipelines, Conduits, Steel pipes, Construction, Pumping plants.
Identifiers: *Force mains.

The construction of a force main to connect the 126th Street bus depot in Corona, Queens, to the New York City sewer system involved tunnelling under 16 active railroad tracks operated by two different companies, a railroad station, a creek, and two 13,000-volt feeder cables. A boring machine was used to drill 180 feet north to the bus depot and 220 feet south to the sewer. Depending on the type of materials encountered by the machine, progress ranged from 1-2ft/day to 30 ft/day. Twenty foot long sections of 30 inch steel pipe were forced ahead of the boring machine and joined to form a conduit for the 8 inch ductile cast iron main. The conduit is sized to be able to handle additional lines if needed in the future. After completion of the conduit and placement of the cast iron main inside, the main was attached to the casing by straps tack-welded by a man who crawled through the narrow tunnel with a supply of steel straps and welding equipment. It required five days to place 40 straps. A pump house constructed next to the bus depot provides the force necessary to move sewage through the main. The pump house contains an electrically operated duplex, vertical, submerged sewage ejector controlled by a transistorized, alternating pump panel housed in this building. (Orr-FIRL)
W76-01455

MIAMI SEWER PLAN TAKES THE POSITIVE APPROACH,
Miami City, Dept. of Public Works, Fla.
J. J. Kay.
Water and Wastes Engineering, Vol 12, No 9, p 31-34, 36, September, 1975. 2 fig, 2 tab.

Descriptors: *Sewers, *Waste water treatment, *Sewage treatment, Florida, Construction materials, Design criteria, Pipelines, Joints(Connections), Infiltration, Installation, Flow rates.
Identifiers: *Sanitary sewers, *Miami(Fla).

The city of Miami, Florida, has been implementing a program to provide new sanitary sewer systems and to upgrade its existing sewers. Combined sewer systems are not desirable as they place too severe a load on the sewage treatment plant during high intensity rain storms, and have very high pumping requirements and maintenance costs. Installation of sanitary sewers in South Florida depends on soil conditions, groundwater elevation, and depth of cut. In many cases, an apparatus called a 'mule' is needed in sewer construction at moderately deep cut ranges where trench sidewalls have become unstable. When a large and deep trunk line is required, a 'piggyback' sewer system is utilized, in which a minimum 8-inch diameter pipe is laid in the same trench and above the larger trunk line. Criteria for design of sanitary sewers include population density, groundwater infiltration, a minimum velocity of 2 feet per second, and an average daily flow of 65 gallons per capita per day. Infiltration problems may be alleviated with the specification that new joints for clay pipe and fittings will be factory bonded joints. Tests for leakage are performed before the acceptance of installation of new sanitary sewers. Replacement of 50 year old concrete pipes with vitrified clay pipe is also being done when major redevelopment within the public right-of-way occurs. (Kramer-FIRL)
W76-01456

SEWER LINE INFILTRATION PROBLEM SOLVED.
Consulting Engineer, Vol 45, No 3, p 96, 98, September, 1975. 4 fig.

Descriptors: *Sewers, *Infiltration, *Pipelines, Equipment, Joints(Connections), Monitoring, Control systems, Remote sensing, Interceptor sewers, Polymers, Repair, Rehabilitation.
Identifiers: *Television inspection, Grouting material.

Repair of an interceptor line laid along a lake shore in Fayetteville, North Carolina, is described. Because the eight-foot sections of concrete pipe had been laid in gravel bedding in water-bearing sand, infiltration was a severe problem. Two thirds of the line had been installed below the lake level and a continuous pressure existed on rubber compression gaskets and joints which could not be reduced by cement collars on the joints or by grouting. The infiltration problem was solved, however, with a system employing closed circuit television and an inflatable sleeve packer. The television camera was pulled through the sewer pipe, with the packer following. The packer was then positioned visually, inflated, and filled with a metered amount of 3M Elastomeric Sewer Grouting Compound and water. The grouting material was released and compacted under pressure as it expanded up to ten times to fill the area with a flexible seal. Six months following this rehabilitation treatment, weir measurements were made to determine flow rates, and it was determined that the repair effort was successful. (Kramer-FIRL)
W76-01457

GROUTING STOPS INFILTRATION IN LARGE DIAMETER STROM DRAIN.
Public Works, Vol 106, No 9, p 82, September, 1975.

Descriptors: *Infiltration, *Polymers, *Sewers, *Rehabilitation, Storm drains, Construction materials, Joints(Connection), Repairing, Pipelines, *Grouting, Louisiana.
Identifiers: Grouting material, Lake Charles(La).

Infiltration into storm sewers has been prevented by a pipe rehabilitation system, applied to Lake Charles, Louisiana. Because the sewer lines were installed about fifteen years ago directly in water-bearing sand, water and sand infiltration have been a serious problem and shifting of the line's four-foot concrete sections has cracked the masonry grout in the joints. A permanent repair method was implemented, using a new hydrophilic polymer grouting material. The system requires a three-man crew and employs a group application probe, a three element inflatable packer, and 3M Elastomeric Sewer Grouting Compound. A faulty joint may be rehabilitated by manually positioning the packer inside the pipe barrel, holding the probe at the application point, and inflating the packer's two end elements to isolate the repair area. The grouting compound is then metered and mixed with water, and injected under pressure into the space between the packer's end elements. The center element is then inflated and compacts the compound into the joint. Because the grouting compound is a low viscosity liquid which expands up to ten times, the joint is filled with a tough but flexible seal within three minutes. After one year of rehabilitation, the system was found to still be preventing infiltration. (Kramer-FIRL)
W76-01458

STEEL SELECTED FOR TIGHT EFFLUENT LINE,
Warren and Van Praag, Inc., Decatur, Ill.
For primary bibliographic entry see Field 8G.
W76-01459

SUBMERSIBLE LIFT STATIONS CUT PUMP MAINTENANCE COSTS.
For primary bibliographic entry see Field 8C.
W76-01460

SEWER INSERTION RENEWAL SAVES TOWN $2.5 MILLION,
For primary bibliographic entry see Field 8G.
W76-01461

SAM: A SEWER SYSTEM MODEL FOR PUBLIC WORKS ENGINEERS,
CH2M/Hill, Corvallis, Oreg.
A. L. Davis, and W. G. O'Neel.
Public Works, Vol 106, No 10, p 78-79, 120, October, 1975, 1 tab, 2 ref.

Descriptors: *Computers, *Model studies, *Sewer systems, Design criteria, Infiltration, Storm runoff, Manholes, Flow rates, Pipelines, Simulation analysis, Oregon.
Identifiers: Portland(Ore), System Analysis Model(SAM).

A System Analysis Model (SAM) for the city of Portland, Oregon, has been designed. This computer model simulates the overloading of the city's combined storm and sanitary sewer system in order to determine where overloading would have occurred and to determine the best route of waste water through the city's sewer system. The model arrives at its conclusion by developing hydrographs and hydraulic gradelines for sewer nodes (usually manholes), by calculating sewage flow from all sources, particularly from storm runoff, and by mathematically routing the sewage through the system. SAM is also used by engineers to keep an inventory of pipe size, length and condition, manhole volume and condition, and to keep maintenance information of all the components. It also has applications in sewer design and sewer system analysis. The SAM is compatible with the Portland IBM 1130 computer, and can be used for a small amount of initial data, offering the flexibility of changing data later. The model was designed in four separate routines to permit its use with the small capacity computer. The modules are storm runoff, sanitary sewage contributions, infiltration and inflow, and routed flow in the sewers. Existing quality routines can be expanded, and SAM can estimate the pollution impact of storm overflow. The model can also be linked to another one called DEAP, which designs, estimates the costs of, and plots new sewer lines. The ultimate usage of SAM is system control, which has been tested in the municipality of Metropolitan Seattle. (Kramer-FIRL)
W76-01463

TREATING SEWAGE.
Australian Patent 461,647. Issued June 5, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 19, p 2112, June, 1975.

Descriptors: *Patents, *Sewage treatment, Separation techniques, Equipment, Waste water treatment, Aeration, Organic matter, Tanks.

A method was patented for the removal of solids from liquid sewage. A tank is described, with a floor which ends in an accumulation zone for solids, parallel to and adjacent to a first side wall. Sewage is passed into the tank, and uniformly distributed along the first side wall which is positioned transverse to the direction of flow. Air is introduced into the sewage adjacent to the first side wall and above the accumulation zone. Thus, fluid containing light organic matter and light particles of grit of a specific gravity greater than the organic matter is forced to flow upward toward a second side wall, opposite the first wall. The wall interrupts the flow and directs it downward to the tank floor by a baffle positioned adjacent to the second wall. At least part of the sewage is passed under the baffle and upward between the baffle and the second side wall where it is removed by flow over a weir which extends the full length of the second side wall. (Kramer-FIRL)
W76-01464

STUDIES ON THE ACTIVITY OF A SODIUM HYPOCHLORITE SOLUTION ON VIBRIO CHOLERAE BIOTYPE ET TOR FOR DRINKING WATER STERILIZATION,
Dakar Univ. (Senegal). Faculty of Medicine and Pharmacy.
J. Baylet, and S. Diop.
Bull Soc Pathol Exot. Vol 65, No 1, p 25-30. 1972. (English Summary).

Descriptors: *Potable water, *Water purification, Human diseases, Diseases.
Identifiers: Chlorite, *Cholera, *Sodium hypochlorite, Tor, Vibrio-Eltor, Water.

Optimal conditions were defined for sterilization of chloera polluted drinking water by a sodium hypochlorite solution.--Copyright 1974, Biological Abstracts, Inc.
W76-01465

METHOD AND APPARATUS FOR PURIFYING WASTE WATERS AND SEPARATING SLUDGE,
K. Stopka.
Canadian Patent 973,830. Issued September 2, 1975. Patent Office Record, Vol 103, No 35, p 39, September, 1975.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, Sludge treatment, Effluents, Ozone.

A patent was issued for the treatment of waste water and the separation of sludge. The effluent liquid is formed into droplets in an ozone containing atmosphere. Suspended material in the water is removed by electrolyzing the water. Hydrogen gas bubbles are thereby produced, which rise to the surface of the water, carrying the suspended material to form floating sludge. The sludge is removed, leaving clarified water. (Kramer-FIRL)
W76-01466

QUICK RELEASE SAFETY TRAP,
For primary bibliographic entry see Field 8C.
W76-01467

WASTE TREATMENT APPARATUS,
L. R. Rosenberg.
United States Patent 3,904,525. Issued September 9, 1975. Official Gazette of the United States Patent Office, Vol 939, No 2, p 768, September, 1975. 1 fig.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, Equipment, Microorganisms.
Identifiers: Biological reactors.

A patent for a biological reactor for waste treatment has been issued. Biological mass growing media is attached to the rotor of a rotating biological reactor. The media consist of a group of wedge-shaped elements, each having opposite planar major surfaces. Each of these surfaces has a pattern of protrusions and depressions, and include coacting projections and receptacles which serve as spacers to keep the elements apart from one another. Alignment means includes pockets in each of the elements and latches whereby pockets of one element align and cooperate for engagement with latches in an adjacent element. (Kramer-FIRL)
W76-01468

ON THE MINIMUM SIZE OF NATURAL-DRAFT DRY COOLING TOWERS FOR LARGE POWER PLANTS,
Cornell Univ., Ithaca, N.Y. Energy Project.
For primary bibliographic entry see Field 8A.
W76-01488

SCALING LAW FOR DRY COOLING TOWERS WITH COMBINED MECHANICAL AND NATURAL DRAFT,
Cornell Univ., Ithaca, N.Y. Energy Project.
For primary bibliographic entry see Field 8A.
W76-01490

5E. Ultimate Disposal Of Wastes

PHOSPHORUS IN THE RURAL ECOSYSTEM--RUNOFF FROM AGRICULTURAL LAND,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W76-01017

THE ROLE OF THE WISCONSIN DEPARTMENT OF AGRICULTURE IN AGRICULTURAL POLLUTION PREVENTION AND CONTROL,
Wisconsin Dept. of Agricultural, Madison.
D. E. Wilkinson.
In: Proceedings of Conference on Farm Animal Wastes, Nitrates and Phosphates, in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, February 1-5, 1971, p 119-124.

Descriptors: *Wisconsin, *Environment, *Farm wastes, Regulation, Legal aspects, Waste disposal, Management, Control.
Identifiers: *Agricultural pollution, *Pollution control.

Donald Wilkinson, Secretary, Wisconsin Department of Agricultural, is optimistic about the prospects of developing a quality environment, one in which there is a high degree of compatibility between the ecological and economic community. There is an ever-increasing problem of cohabitation. The important part of this human-animal relationship is waste disposal and a clean environment. Since the total farm income in Wisconsin exceeds 1.6 billion dollars and since the livestock industry produces about 86 percent of this total, animal waste disposal is very important. The Department of Agricultural is concerned with many other types of wastes as well. Wilkinson stresses that it is foolish to think that environmental pollution can be managed by assigning agricultural waste and pollution to farmers, industrial pollution to industrialists and other types of wastes to the public in general. He feels that environmental problems will be solved only by integrated effort and coordinated management of resources at the rural-urban interface. (Cameron-East Central Oklahoma State)
W76-01018

SOIL POLLUTANTS AND THEIR EFFECTS ON CLEAN WATER,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W76-01020

FARM POLLUTION: HOW REGULATIONS AFFECT YOU.
For primary bibliographic entry see Field 6E.
W76-01022

ENVIRONMENTAL, ECONOMIC, AND PHYSICAL CONSIDERATIONS IN LIQUID HANDLING OF DAIRY CATTLE MANURE,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
G. L. Casler, and E. L. LaDue.
New York's Food and Life Sciences Bulletin (Social Sciences: Agricultural Economics, No 1), No 20, 23 p. October, 1972. 10 tab, 42 ref.

Descriptors: *Dairy industry, *Cattle, *Farm wastes, *Waste storage, *Waste treatment, *Waste disposal, *Liquid wastes, Odor, Runoff, Economics, Nutrients, Costs, Storage tanks, Oxidation lagoons, Water pollution sources, Agricultural runoff, Cost-Benefit analysis.
Identifiers: Land spreading, Slatted floors, Open pits, Manure.

The environmental, economic, and physical implications of liquid manure handling for dairy cattle is considered. It was found that six months storage of liquid manure for disposal in the spring is not always beneficial. Large quantities of manure spread in the spring just before a heavy rain may cause more stream pollution than small quantities spead daily during the winter. Also, odor is more offensive in the spring. An investment of $27,000-$37,000 would be required for a 100-cow liquid manure system with a six month storage capacity.

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Labor savings and increased manure value offset only a small part of the annual costs of a liquid manure system. The total return to the farm operator will rarely offset the costs incurred. Even if all costs and benefits could be internalized to the farm level costs would usually exceed benefits. (Ballard-East Central Oklahoma State)
W76-01023

FEEDLOT WASTE MANAGEMENT SYSTEMS,
R. C. Albin.
In: Proceedings of the 1970 Beef Cattle Conference, Texas Tech University Animal Science Department, Lubbock, and Texas Tech University Research Center, Pantex, October 29, 1970, p 8-17. 26 ref.

Descriptors: *Farm wastes, *Feed lots, Pollutants, Waste treatment, Waste disposal, Runoff, Aerobic conditions, Anaerobic conditions, Lagoons, Dehydration, Incineration, Recycling, Agricultural runoff, Farm management, Oxidation.
Identifiers: *Waste management systems, Land spreading, Composting, Oxidation ditches.

The rapid expansion of cattle feedlots in the U. S. created the problem of handling and disposing of a vast quantity of feedlot wastes. The chemical and pollutional characteristics of feedlot wastes vary. The type of ration, size of cattle, climate, feedlot surface, and moisture content are all important factors in developing a waste management system. Numerous handling and disposal systems such as anaerobic and aerobic systems, lagoons, composting, oxidation ditches, dehydration, incineration, and nutrient recycling are available. However, final disposal of feedlot waste has been on land in most instances. The Great Plains Agricultural Council report recommended that research efforts be intensified in the areas of air pollution, land disposal, pollution under feedyards, systems analysis, complete economic evaluation of current alternatives for waste disposal, and socio-legal implications. (Dudley-East Central Oklahoma State)
W76-01024

AVERT RUNOFF POLLUTION,
For primary bibliographic entry see Field 5D.
W76-01025

EXPERIENCE WITH A SPRAY-RUNOFF SYSTEM FOR TREATING BEEF CATTLE FEEDLOT RUNOFF.
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-01026

FEEDLOT POLLUTION,
Montana State Dept. of Health, Helena. Water Pollution Control Section.
D. G. Willems.
In: Proceedings of the Annual Agricultural Seminar Montana Agriculture-Focus on Improving the Environment, Great Falls, Montana, December 3-4, 1970, p 31-34.

Descriptors: *Feed lots, *Air pollution, *Water pollution sources, *Montana, *Regulation, *Legal aspects, *Permits, Waste disposal.
Identifiers: *Point source wastes, Land disposal.

The Montana water pollution control law prior to 1970 is delineated. Its greatest effect was upon industry and municipalities because their point source wastes were easy to identify and treat. But agricultural pollution must be met as well. Confined animal feeding drainage may well be the largest point source discharge in terms of organic material. The purpose of the proposed 1970 confined animal feeding regulation is: (1) to see that feedlot operations are properly located with respect to municipalities and residential areas, and (2) to control air and water pollution problems. The regulation would require new feedlots and expanding feedlots to secure a permit from the Department of Health as soon as the regulation is adopted. (Hisle-East Central Oklahoma State)
W76-01027

GRASS-FILTER SYSTEMS--ANOTHER NEW RUNOFF CONTROL METHOD.
Feedlot Management, Vol 15, No 5, p 42, May, 1973.

Descriptors: *Waste treatment, *Waste disposal, *Runoff, *Control, *Farm wastes, *Fescues, Aerobic conditions, Lagoons, Feed lots, Kansas, Nutrients, Soil bacteria, Agricultural runoff.
Identifiers: *Grass filter systems.

A fescue grass-filter system for absorbing and treating runoff is being tested at the 20,000 head Blackjack Feedyards, Inc. near Yates Center, Kansas. The system is based on fescue grass over which lagoon-collected runoff is sprayed irrigation-style. A buildup of soil bacteria which forms a mat on the ground digests the feedlot waste solids purifying the runoff. Mat depth must be kept at less than 1 inch at all times or the system will become anaerobic. Grass is necessary to hold the solids on the land so that the bacteria can multiply and digest the material. Fescue grass is a good choice for eastern Kansas because of its adaptability to heavy moisture. If winter icing problems and year round mat buildup can be combatted effectively, it is hoped that grass-filter systems will be an acceptable method of treating and disposing of runoff. (Cartmell-East Central Oklahoma State)
W76-01028

AREA NEEDED FOR LAND DISPOSAL OF BEEF AND SWINE WASTES,
Iowa State Univ., Ames, North-Central Regional Extension Project.
D. H. Vanderholm.
Cooperative Extension Service Publication Pm-552, Iowa State University, Ames, January, 1973, 2 p, 4 tab.

Descriptors: *Farm wastes, *Cattle, *Hogs, *Waste disposal, *Nitrogen, Phosphorus, Potassium, Formulation, Irrigation, Waste treatment, Management, Waste management, Lagoons, Mathematical analysis.
Identifiers: *Land disposal, Oxidation ditches, Deep-pit storage, Anaerobic lagoons, Bedded confinement, Open lots, Manure.

Formulas were established to determine the areas required for land disposal of hog and cattle wastes. The formulas are based upon an estimated 120 pounds of nitrogen excreted per 1000 pound-cow and 18.25 pounds per 100 pound-hog, varying with ration, breed, and size of the animal. Nitrogen losses in treatment, storage, and handling have been established for six types of management systems to arrive at recommended disposal areas based upon 100 pound Nitrogen applications per acre. Corresponding P and K rates are given. Approximate nutrient content of various farm waste forms are given. (Frantz-East Central Oklahoma State)
W76-01029

LIQUID MANURE MANAGEMENT FOR SWINE,
Texas Agricultural Extension Service, College Station.
B. R. Stewart, and J. M. Sweeten.
Agricultural Extension Service paper, June 15, 1972, 24 p, 2 fig, 5 tab, 5 ref.

Descriptors: *Liquid wastes, *Farm wastes, *Management, *Hogs, Waste storage, Waste treatment, Waste disposal, Legal aspects, Lagoons, Regulation, Runoff, Confinement pens, Rates of application, Nutrients, Irrigation, Agricultural runoff, Farm management.
Identifiers: *Manure, Land disposal, Storage pits, Slotted floors, Open pits.

Texas regulatory guidelines are stated which give minimum requirements for preventing water pollution from confined feeding operations. Treated or untreated wastes may not be discharged to water courses except under rare rainfall events, therefore, alternative measures must be used. For confinement operations, this may mean (1) daily scraping and cleaning of wastes for lagoon or pit storage, followed by land disposal, (2) use of slatted floors for collecting animal wastes in storage pits, followed by land disposal, or (3) use of slatted floors for catching animal wastes in shallow under-floor pits which discharge continuously into an outside lagoon. Pasture and open lot operations require solid waste management techniques with the exception of having to catch rainfall runoff in retention ponds. Specific design and management requirements are given for liquid waste storage, treatment, and land disposal of swine wastes. (Marquard-East Central Oklahoma State)
W76-01030

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W76-01031

EVALUATION OF ANAEROBIC LAGOON TREATING SWINE WASTES,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5D.
W76-01032

SOME PHYSICAL AND ECONOMIC ASPECTS OF WATER POLLUTION CONTROL FOR CATTLE FEEDLOT RUNOFF,
Texas Tech Univ., Lubbock.
T. R. Owens, D. Wells, W. Grub, R. C. Albin, and E. Coleman.
Typescript, N. D. 21 p. 9 tab.

Descriptors: *Water pollution, *Control, *Runoff, *Farm wastes, *Feed lots, *Cattle, *Economics, *Waste treatment, *Waste storage, *Waste disposal, Costs, Texas, Chemical properties, Irrigation, Basins, Model studies, Rainfall, Evaporation, Performance, Agricultural runoff.
Identifiers: Land disposal, Slotted floors, Manure, Playa lake disposal.

Quantitative and qualitative aspects of feedlot runoff are studied. Average concentrations of pollutants in feedlot runoff are determined. Collection basin designs were discussed as runoff control measures. Comparative operating and investment costs are approximated with limitations discussed. Open land disposal has been attempted but modified environmental feeding on slotted floors is recommended as an approach to the problem. Pros and cons of the latter are discussed. (Wetherill-East Central Oklahoma State)
W76-01034

SLUDGE DISPOSAL: A CASE OF LIMITED ALTERNATIVES.
For primary bibliographic entry see Field 5D.
W76-01035

THEY'RE GETTING THE JUMP ON POLLUTION CONTROLS,
R. Graves, and C. Hartman.
Hoard's Dairyman, Vol 119, No 12, p 768, June 25, 1974. 1 fig.

Descriptors: *Water pollution, *Control, *Confinement pens, *Farm wastes, *Runoff, *Diversion, Dairy industry, Waste storage, Livestock, Agricultural runoff.

dentifiers: Manure, Environmental Eye Project.

armers in Lafayette County, Wisconsin, are emonstrating that they will respond to positive, ensible programs aimed at controlling pollution nd stream degradation from confinement vestock operations. With impetus provided by ie county extension office and soil and water onservation district, many groups and agencies re involved in making the 'Environmental Eye' a ommunity project. The idea behind this project egan in the spring of 1972. An environmental eye both a real thing and a 'gimmick'. Looking at a illside farmstead as an eyeball, a diversion up hill om the buildings forms and eyelash. A collection hannel or diversion below the buildings ompletes the eye. These two diversions are imortant parts of any barnyard runoff control proct. For most small yard situations, the diversion f water from above the barn prevents manure om being flushed or washed out of yards or torage areas. Rain falling directly on the yard will ash away little manure. This usually can be conrolled by directing it away from streams or itches to nearby pasture or cropland. If more conrol is necessary, a solids separation area, detenon pond, or both, can be added at the end of the ollection channel. (Cartmell-East Central klahoma State)
V76-01036

HE PROBLEM OF FARM ANIMAL WASTE ISPOSAL,
hio State Univ., Columbus. Dept. of Agricultural ngineering.
. P. Taiganides.
anagement of Farm Animal Wastes, roceedings National Symposium on Animal aste Management, American Society of Agricultural Engineers, Michigan State University, May -7, 1967, p 5-8, 1 tab, 10 ref.

escriptors: *Farm wastes, *Waste disposal, Livestock, *Poultry, *Confinement pens, agoons, Odor, Runoff, Water pollution, Costs, Agricultural runoff.
dentifiers: *Animal wastes, Land application.

nimal wastes are one of the six sources of farm astes whose management and disposal have ecome one of the most challenging problems of odern farming. The factors which cause and/or ggravate the animal waste disposal problem are: roperties of animal wastes, current methods of vestock and poultry production, expansion of rban centers into rural areas plus public awareess of the need for healthy and aesthetically leasant environment, and inadequacy of present ethods of manure handling and disposal. On the asis of population equivalence data reported by aiganides and Hazen (1966) the daily wastes from oultry, swine, and cattle alone are equivalent to 0 times the wastes of the human population of the nited States. American animal producers seek aste disposal methods which have low labor equirements, reduce nuisance conditions, and imrove sanitation. They are limited by lack of echnical information and by the misconception hat they should be able to dispose of manure at no xtra cost. This lack of both the basic and applied nowledge necessary for successful handling, reatment, and disposal of farm wastes makes esearch in this area a unique challenge. Marquard-East Central Oklahoma State)
V76-01037

ANURE WASTE PONDING STUDY,
alifornia State Water Resources Control Board, acramento.
or primary bibliographic entry see Field 5D.
V76-01038

UNOFF CONTROL SYSTEMS FOR CONCRETE DAIRY CATTLE YARDS,
isconsin Univ., Madison. Coll. of Agricultural nd Life Sciences.
For primary bibliographic entry see Field 5B.
W76-01039

FIELD PERFORMANCE OF SELECTED BEEF FEEDLOT WASTE HANDLING SYSTEMS,
Illinois Univ., Urbana-Champaign.
D. H. Vanderholm, J. C. Lorimor, and S. W. Melvin.
Presented at 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974. Paper No 74-4015, 9 p, 5 fig, 2 tab, 2 ref.

Descriptors: *Cattle, *Farm wastes, *Management, *Feedlots, *Monitoring, *Waste storage, *Waste disposal, *Corn belt, Oxidation lagoons, Control.
Identifiers: *Pollution control, Holding ponds.

Four feedlots were selected as research and demonstration sites to study waste management alternatives in the Corn Belt. Two were unsurfaced open lots utilizing holding ponds. The other two were cold confinement slotted-floor barns, one with a conventional deep pit manure storage and one with an under-flood oxidation ditch system. No attempt was made to rate the systems relative to one another, but data and observations were intended to provide a basis for evaluating the systems individually and collectively. All of the systems described in this paper were adequate to meet current pollution control regulations when adequately sized and properly managed. (Cartmell-East Central Oklahoma State)
W76-01040

A CHARACTERIZATION OF THE EFFLUENT FROM COMMERCIAL CATFISH PONDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-01041

BIOLOGICAL TREATMENT OF FEEDLOT RUNOFF FOLLOWING SETTLING,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-01042

MODELS FOR HANDLING SOLID MANURE,
B. Eftink, and L. Searle.
Successful Farming, Vol 71, No 11, p 28-30, October, 1973.

Descriptors: *Solid wastes, *Farm wastes, *Management, Feed lots, Hogs, Cattle, Waste storage, Irrigation, Lagoons, Runoff, Costs, Capacity, Illinois, *Waste disposal.
Identifiers: *Manure, *Handling.

Solid waste handling systems are discussed. One waste system requires less than 50 hours per year handling manure from 2,500 hogs. It utilizes 100 feet lengths of perforated polyvinyl chloride plastic pipe for irrigating holding pond water. Costs, capacities and problems of irrigating, scraping, storing and stacking animal wastes are discussed. (Frantz-East Central Oklahoma State)
W76-01043

COSTS NOTED FOR SOLID AND LIQUID WASTE SYSTEM.
For primary bibliographic entry see Field 5D.
W76-01044

CATTLE FEEDLOT POLLUTION STUDY,
Texas Tech. Univ., Lubbocks. Dept. of Agronomy.
E. A. Coleman, W. Grub, R. C. Albin, G. F. Meenaghan, and D. M. Wells.
Interim Report No. 2 to Texas Water Quality Board, Texas Tech University Water Resources Center, Lubbock, Texas, April, 1971, WRC-71-2, 20 p. 8 tab.

Descriptors: *Waste treatment, *Waste disposal, *Cattle, *Feedlots, *Irrigation, *Runoff, Application rates, *Soil contamination, *Farm wastes, Salts, Cotton, Grain sorghum, Soybeans, Bermudagrass, *Agricultural runoff.

Germination studies, test plot studies, and field studies were made to determine beneficial or nonharmful rates at which runoff from cattle feedlots can be applied to growing crops. Results indicate that such runoff must be applied with caution to most crops, as it is very detrimental to the germination of most field crops in the High Plains area of West Texas and is also detrimental to seedlings in the same area. However, relatively low application rates are beneficial to mature crops at least on a short term basis. The buildup of soluble salts in the upper 30 inches of the soil profile indicates that land disposal may not be the ultimate solution to runoff disposal. (Wetherill-East Central Oklahoma State)
W76-01045

CHANGES WE'VE MADE IN MANURE HANDLING.
Hoard's Dairyman, Vol 118, No 3, p 152-153, 204-205, February 10, 1973. 4 fig.

Descriptors: *Farm wastes, *Waste storage, *Waste disposal, *Runoff, *Costs, Cattle, Dairy industry, Equipment.
Identifiers: *Manure, Storage pits.

Four dairymen with herds ranging from 30 to 230 cows discuss changes in their waste handling methods. All have switched to storage pits and then to land disposal at costs ranging from $850 to $6,000. Each farmer explains his variation of waste storage with respect to less frequent handling and controlling runoff. Costs, disposal practices and manure pits of each system are discussed. (Frantz-East Central Oklahoma State)
W76-01046

INCLUSION OF DRIED POULTRY WASTE AS A FEED INGREDIENT IN CATFISH RATIONS,
Texas Agricultural and Extension Service, College Station.
J. C. Fowler, and J. T. Lock.
Feedstuffs, Vol 46, No 44, p 36, October 28, 1974. 1 fig, 2 tab, 4 ref.

Descriptors: *Catfishes, *Diets, Proteins, Performance, Taste, Poultry, Farm wastes.
Identifiers: *Poultry waste.

A study was done to determine the feasibility of including air dried poultry waste as a feed ingredient in catfish rations. Air-dried manure was used in the diets at a dietary level of 25 percent. All diets were calculated to contain essentially equal amounts of crude protein assuming that the hen manure contained 21 percent protein. Catfish consuming diets containing air-dried poultry waste had better weight gain than catfish consuming the control diet over the 150 day feeding period. Taste panel evaluation of the test tissue and control tissue revealed no significant differences. (Cameron-East Central Oklahoma State)
W76-01091

THESE STOCKYARDS' SOLUTIONS COULD WORK FOR YOU.
For primary bibliographic entry see Field 5D.
W76-01093

FARMLAND FARM STRESSES NO RUNOFF, LATEST TEST RESULTS.
For primary bibliographic entry see Field 5D.
W76-01094

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GENERALIZED GEOLOGIC FRAMEWORK OF THE NATIONAL REACTOR TESTING STATION, IDAHO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8E.
W76-01191

TECHNOLOGY FOR THE CONVERSION OF SOLAR ENERGY TO FUEL GAS.
Pennsylvania Univ., Philadelphia.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 103, $6.75 in paper copy, $2.25 in microfiche. Report NSF/RANN/SE/GI34991/PR/73/4, January 31, 1974. 153 p, 34 fig, 10 ref, 35 tab.

Descriptors: *Methane, *Solid wastes, *Vegetation, *Fermentation, Methane bacteria, Algae, Water hyacinth, Kelps, Farm wastes, Grasses, Domestic wastes, Anaerobic conditions, Water pollution sources, Fueld, Gases.

The formation of methane by anaerobic fermentation of paper, grass, household garbage, freshwater algae, water hyacinth, seaweed, cattle manure, dry manure, and dry dog food, separately or in various mixtures, was studied. The fermentations were carried out in sea water as well as in freshwater and at temperatures ranging from 33 to 48C. The digesters were operated as single-stage reactors in which both the acidogenic and methanogenic bacteria are present, or as two-stage digesters in which the groups of bacteria are separated into the two tanks operating in series. The most satisfactory materials for conversion to methane were freashwater algae (Chlorella) and a marine giant kelp (Macrocystis pyrifera). Water hyacinth and common seaweed (Ascophyllum nodosum) were resistant to attack by methane-producing bacteria. Conversion of these materials was improved by pretreatment with cellulase or hot sodium hydroxide. Conversion of untreated animal waste was fairly effective, although pretreatment with hot sodium hydroxide appeared to improve conversion efficiency. Methane productivity from the two-stage digestion system was approximately equal to that from the singlestage system under essentially equivalent operating conditions. (Witt-IPC)
W76-01218

CONTAINMENT AREA FACILITY CONCEPTS FOR DREDGED MATERIAL SEPARATION, DRYING, AND REHANDLING,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 2G.
W76-01220

TREATMENT OF WASTE WATERS FROM A COMBINED SEWER SYSTEM (EGYESITETT RENDSZERU CSATORNAHALOZAT SZENNYVIZEINEK TISZTITASA),
For primary bibliographic entry see Field 5D.
W76-01276

EXPERIMENTAL PROGRAM FOR UNWATERING DIGESTED DOMESTIC SEWAGE SLUDGE UNDER PLANT CONDITIONS (TERV A ROTHASZTOTT VAROSI SZENNYVIZTELEPI ISZAP UZEMI VIZTELENTESI KISERLETERE),
M. Tamas.
Hidrologiai Kozlony, Vol 52, No 11, p 489-495, November, 1972. 3 fig, 12 ref.

Descriptors: *Waste water treatment, *Sludge, *Dewatering, Treatment facilities, Pilot plants, Filters, Municipal wastes.
Identifiers: Hungary, Vacuum-drum filter.

Plans for an experimental sludge dewatering installation serving at domestic waste water treatment plants in Hungary are described. Earlier technio-economic considerations controlling the application of dewatering in Hungary are reviewed and reasons justifying the construction of the experimental installation indicated. In this context, the preparatory work preceding the designing of the experimental plant, the considerations governing the selection of the technology, and the problems which the pilot plant is expected to answer are formulated. Under the expansion program of the existing treatment plant at Szekesfehervar an experimental vacuum-drum filter will be added. Information is presented for the plant experiments envisaged, on the procedure of experimentation, and data processing. (Sandoski-FIRL)
W76-01283

DISPOSAL OF DOMESTIC WASTEWATER BY HILLSIDE SPRAYS,
California State Dept. of Public Health, Berkeley. Bureau of Sanitary Engineering.
E. Seep.
Journal of the Environmental Division, American Society of Civil Engineers, Vol 99, No EE2, p 109-121, April, 1973. 1 fig, 23 ref.

Descriptors: *Waste water disposal, *Spraying, Soils, Surface runoff, Design, Sewage, Effluents, California. Operation and maintenance, Land treatment.
Identifiers: Land disposal, Hillside land application.

Hillside land disposal spraying is a reliable method of domestic waste water land disposal which can be used in areas where the soils are not suitable for subsruface disposal or the terrain is too rough for the construction of evapotranspiration-percolation ponds. It is being practiced at approximately 100 camps, subdivisions, and small communities located on foothill and mountain areas throughout California. The goal of the disposal area design is to provide a system which will operate reliably with no surface runoff from the designated area. Design considerations involve: climate and hydrology; geology, soil properties, and topography; treatment capability of soil; application rates; distribution system; public health and reliability requirements; and, operation and maintenance. The principal operational aspects of the spray disposal system are as follows: records are kept of all sewage bypasses, power failures, effluent runoff, and disinfectant uses. Dosing is intermittent to maintain aerobic conditions and high infiltration rates. Spray areas are alternated to provide rest periods for breakup of biological slimes. No spraying is done on bare or disturbed soil, during rainstorms, or when the soil is saturated. No spraying is done during strong winds if the spray is carried toward nearby human habitations. Spray areas are inspected periodically for clogged sprinklers, dripping nozzles, broken pipes, leaking joints, erosion, and runoff. Spare parts should be maintained for all essential disposal functions to enable speedy repair of broken down equipment. (Sandoski-FIRL)
W76-01295

THE ELIMINATION OF PHOSPHATES AND NITRATES OF WASTE WATER BY ALGAE CULTURES: I (/N FLEMISH),
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Anorganiche Technische Chemie, Elektrotermie en Elektrochemie.
For primary bibliographic entry see Field 5D.
W76-01312

DISPOSAL OF FARM ANIMAL WASTES THROUGH THE SOIL,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5B.
W76-01384

CONFINEMENT LIVESTOCK FACILITIES WASTE MANAGEMENT CODE OF PRACTICE.
For primary bibliographic entry see Field 5D.
W76-01386

AGRICULTURAL WASTES, (LITERATURE REVIEW),
Mississippi State Univ., State College.
For primary bibliographic entry see Field 5D.
W76-01390

OCEAN OUTFALLS AND OTHER METHODS OF TREATED WASTE-WATER DISPOSAL IN SOUTHEAST FLORIDA, (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5D.
W76-01413

HOW MANY WASTEWATER TREATMENT PLANTS ARE NECESSARY IN REGIONAL SEWER SYSTEMS. (HANY SZENNYVIZTISZTITO TELEP LEGYEN A REGIONALIS CAATORNAERNDSZEBEN).
For primary bibliographic entry see Field 5D.
W76-01429

WET OXIDATION DISPOSAL OF WASTE MATTER IN SUSPENSION.
French Patent FR 2244-722. Issued May 23, 1975. Derwent French Patents Abstracts, Vol W, No 26, p 4, August, 1975.

Descriptors: *Waste disposal, *Oxidation, Waste water treatment, Organic matter, Biochemical oxygen demand, Chemical oxygen demand.

A reactor for wet oxidation disposal of waste matter in suspension has been patented. The reactor is essentially a horizontal, cylindrical autoclave, divided into several compartments by vertical partitions. An inlet line delivers liquid into the first of these compartments. Each compartment contains a top entry, high speed rotary shaft, with two vertically spaced agitators, and a bottom entry oxygen/air inlet nozzle. The nozzle is directed onto the underside of the lower agitator and disperses fine bubbles into the liquid. Transfer pipes aid in moving the liquid between compartments and in discharging it from the final chamber via separate vapor and liquid outlets. In the disposal of waste organic matter, BOD and COD values are reduced by 80 to 90%. Because of the intense dispersal of fine oxygenation bubbles, the process performs well at lower temperatures than previous wet oxidation processes. (Kramer-FIRL)
W76-01430

CENTRIFUGING PLANT IN THE PURIFICATION PLANT MUNICH-GROSSLAPPEN (ZENTRIFUGENLAGE IM KLAERWERK MUENCHEN-GROSSLAPPEN),
For primary bibliographic entry see Field 5D.
W76-01439

5F. Water Treatment and Quality Alteration

WATER SUPPLIES FOR LOW-INCOME COMMUNITIES IN DEVELOPING COUNTRIES,
Birmingham Univ. (England) Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-01004

EXPERIMENTAL EUTROPHICATION OF TERRESTRIAL AND AQUATIC ECOSYSTEMS. FIRST ANNUAL REPORT OF THE UPLAND RECHARGE PROJECT,
Brookhaven National Lab. Upton, N. Y. Biology Dept.
For primary bibliographic entry see Field 5D.
W76-01155

THE SEWERS OF PARIS (LES EGOUTS DE PARIS),
Paris (France).
For primary bibliographic entry see Field 5D.
W76-01293

DEVELOPMENT AND USE OF FLOATING FILTERING MATERIALS IN WATER FILTRATION (RAZRABOTKA I VNEDRENIE PLAVAYUSHCHIKH ZAGRUZOK FIL'TROVANIYA VODY),
M. G. Zhurba, S. I. Moroz, and D. D. Myagkiy.
Vodsnabzhenie i Sanitarnaya Tekhnika, No 5, p 13-17, 1975. 2 fig, 3 tab, 6 ref.

Descriptors: *Filtration, *Water treatment, *Waste water treatment, *Industrial wastes, Municipal wastes, Flotation, Tanks, Filters, Potable water, Suspended solids.
Identifiers: Filtering materials, Polystyrene foam.

Floating filtering materials and their uses are described. Polystyrene foam and lightweight aerated granules of originally compact materials are used as floating filter materials, arranged in filter tanks in one or more layers, or at one or more (usually two) levels. Floating filtering materials can be used for the purification of industrial and municipal waste water, and for the preparation of potable water from natural water. The suspended matter content in the water to be purified should not be greater than 500 mg/liter, and the rate of filtration should be between 0.6 and 2 m/hr. The granules of the filtering material should be 0.3-1.5 mm in diameter. The combined thickness of the filtering material arranged at two levels or in two layers is optimally between 0.7 and 1.2 m. Filtration rates over 20 m/hr are possible for drinking water preparation. (Takacs-FIRL)
W76-01438

EVOLUTION OF OPERATION CONTROL IN WATER TREATMENT (A VIZTISZTITASI TECHNOLOGIAK UZEMIRANYITASANAK FEJLODESE),
For primary bibliographic entry see Field 5D.
W76-01450

THE QUALITY AND TREATMENT OF ARTESIAN WATERS IN HUNGARY (A HAZAI MELYSEGI VIZEK KEZELESENEK SZUKSEGESSEGE ES TECHNOLOGIAJA),
L. Kolin.
Hidrologiai Kozlony, Vol 55, No 6, p 236-244, June, 1975. 8 fig, 2 tab, 4 ref, 8 photo.

Descriptors: *Water treatment, *Potable water, *Water supply, *Acquifers, Iron, Methane, Manganese, Filtration, Artesian wells.
Identifiers: *Hungary, Melyepterv.

The main source of potable water supply in Hungary is artesian waters contained in aquifers 100 to 400 m deep. The water obtained had been of good drinking water quality. Recently, however, dissolved iron and manganese have been detected in amounts exceeding allowable limits. Additionally, considerable amounts of gas containing methane have appeared in these artesian waters. Therefore, prior to introduction into the distribution network, the artesian waters must be appropriately treated by iron and manganese removal as well as by degassing. Iron and manganese are removed by a conventional technique, involving oxidation with air under pressure, followed by filtration on two-layer sand filters. Surface aeration by means of revolving brushes has been applied for de-gassing, and tests are under way on a more simplified and economical new method. (Kramer-FIRL)
W76-01453

5G. Water Quality Control

WATER RIGHTS AND WATER QUALITY MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
Journal of the Hydraulics Division, American Docicty of Civil Engineers, Proceedings paper No. 11156, Vol 101, No HY3, p 511-516, March 1975. 17 ref.

Descriptors: *Water resources, *Water quality control, *Management, *Water rights, *Judicial decisions, *Institutional constraints, Administrative agencies, Letgislation, Regulation, Social needs, Planning.
Identifiers: Litigation, Restraint systems, Water uses.

Water rights constitute the oldest institutional arrangement for control of water quality, but recent decades have seen extensive development of alternative controls. These new mechanisms for water quality management have replaced the system of water rights as the primary institution for quality control, but these rights still function in an important supplementary capacity. Examined is the nature of the water right as related to quality and the reasons why a different institutional arrangement for management has become necessary. Any qualitative change that substantially interferes with other legally-recognized uses of water is in violation of water rights, but the determination of whether or not a particular quality alteration is in violation of the rights of others is a function of the judicial process. The fact that water rights require court action for their enforcement is a basic defect with regard to their effectiveness as an institution for water quality management. Specific weakness as a managerial mechanism include the responsive nature of court action, the limited scope of litigation between individuals, and the burden of proof facing the injured party. These weaknesses are largely overcome by the administrative agency approach, a basic reason for its widespread acceptance at present. Regarding water quality planning, water rights are restricted to the passive role of establishing guidelines, providing general limitations for the framework within which an administrative agency can make detailed planning decisions. (Bell-Cornell)
W76-01001

AN OPTIMIZATION MODEL FOR BALANCING ECONOMIC-ENVIRONMENTAL SYSTEMS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
D. Panagiotakopoulos.
Candian Journal of Civil Engineering, Vol 2, No 1, p 1-9, March 1975. 5 fig, 8 ref.

Descriptors: *Environmental control, *Economics, *Pollution abatement, *Wastes, *Methodology, Optimization, Costs, Water quality, Treatment, Networks, Management, Disposal, Sewerage, Decision making, Operations, Water policy, Biochemical oxygen demand, Simulation analysis, Computers, Mathematical models, Systems analysis.
Identifiers: Comprehensive analysis, Data reduction, Absorbing capacity.

Resolutions of conflicts within an economic-environmental system are challenges that engineers often face, since they are expected to provide the decision-makers with the trade-offs involved among the various levels of the waste generating economic activities, the resulting environmental quality, and spending for attaining it. A methodology is presented for resolving such conflicts. The methodology is based on a waste management network model which allows for an efficient and systematic search among the possible waste management systems linking generated wastes with the environment, and also for their evaluation on the basis of the balance of their burdens on the various environmental forms and the operating budget. Recycling, discharge and effluent standards, charges, damage costs, and various budgeting schemes can be handled. Dynamic analyses for long-range financial planning under an expected increasing rate of waste generation are possible. For a simple hypothetical case, the model is set up, available data are reduced to usable forms, and trade-off curves are obtained through simulation analysis. (Bell-Cornell)
W76-01002

FEDERAL-STATE RELATIONS IN WATER QUALITY PLANNING,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
M. S. Alushin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY3, Proceedings paper No 11160, p 523-531, March 1975. 9 ref.

Descriptors: *Water resources development, *Water quality control, *Legislation, *Regions, *Planning, Pollution abatement, Sewage treatment, River basins, Management.
Identifiers: *Federal-state relationships.

With the passage of the 1972 Amendments to the Federal Water Pollution Control Act, the Federal government for the first time significantly entered the field of water quality planning. The 1972 Act requires two distinct planning processes: (1) Statewide basin planning designed to accomplish general water quality planning and to establish maximum daily loads for areas where waste load allocations are needed; and (2) waste treatment management planning which is designed to provide a detailed description of the physical and institutional requirements for treatment works and waste management in limited areas characterized by urban-industrial concentration. The U.S. Environmental Protection Agency delay in promulgating regulations and a lack of Federal funding during 1972-1974 resulted in virtually no planning being done during that period. Even though Section 510 of the Act reserves rights to states and preserves their ability to adopt standards that are more stringent than Federal standards, the planning processes launched by Section 303(e) and Section 208 are explicit provisions which preclude options for the states. States are required to adopt a water quality standard approach. A drastically different method of water pollution management, such as effluent charges, would be preempted by the Federal statute. Nevertheless, most of the planning and standard setting is to be done by state or local agencies. (Bell-Cornell)
W76-01003

WATER SUPPLIES FOR LOW-INCOME COMMUNITIES IN DEVELOPING COUNTRIES,
Birmingham Univ. (England) Dept. of Civil Engineering.
R. G. Feachem.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 101, No EE5, Proceedings paper No 11608, p 687-702, October 1975. 6 tab, 16 ref.

Descriptors: *Water supply development, *Public health, *Water quality control, Forecasting, Hydraulics, Diseases, Population, Growth rates, Effects, Resource allocation, Standards, Design, Benefits, Evaluation, Costs, Data collections.
Identifiers: *Developing countries, *Water supply impacts, Low-income, Water collection, Improvement, Water plans, Municipalities.

In 1970, the World Health Organization found that 86% of the rural population in developing countries were without safe water. Presented is an analysis of the potential impact of a water supply system in a poor tropical community; considered are techniques for quantification of this impact.

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Special attention is paid to the water collection journey and to the anticipated improvements in community health. A useful approach is to identify specific design benefits and to base the design of an improved scheme on the achievements of these benefits. Various possible benefits are listed; savings in time and energy expended in water collection and improvements to health are suggested as being realistic design benefits for most situations. A classification of water-related disease is presented and the effect of water supplies on various water-related infections is analyzed. A comprehensive table, showing the principal features of these diseases, is included. Improvements to specific water-related infections can be used as design benefits for water supply schemes. A more rigorous approach to improving the standards of water supply facilities in developing countries is needed. An analysis of water supply impacts, particularly concerning water collection and health, can facilitate superior designs and more rational resource allocation for water supply programs. (Bell-Cornell)
W76-01004

FORMULATION AND USE OF PRACTICAL MODELS FOR RIVER QUALITY ASSESSMENT,
Geological Survey, Portland, Oreg. Water Resources Div.
W. G. Hines, D. A. Rickert, S. W. McKenzie, and J. P. Bennett.

Descriptors: *River basins, *Water quality, *Behavior, *Mathematical models, Hydrology, Alternative planning, Management, Simulation analysis, Evaluation, Physical properties, Biological properties, Chemical properties, Dissolved oxygen, Biochemical oxygen demand, Decision making, Date collections, Systems analysis.
Identifiers: Scientific assessment, Environmental impact, Model improvement, River phenomena, Date base, Willamette River(Ore.).

Complexities inherent in the study of large rivers and the need for quantitative description of river quality behavior have generated increasing interest in mathematical modeling. In concept, mathematical models have great potential as practical tools for predicting the impact of alternative planning proposals on river quality phenomena. A basis is provided for examining potential shortcomings in proposed river quality models and suggestions are made for improving them. Considered are six major deficiencies common to many applied modeling efforts: (1) application to a variable or process that is too complex for formulation of a practical, applied model; (2) application of a sophisticated, general case model without adequate understanding of the particular river in question; (3) failure to recognize the importance of basin hydrology in defining the critical planning and management decision periods for model simulation; (4) misapplication of model calibration and verification procedures; (5) use of a poor data base for interpretation, calibration, and verification; and (6) failure to format results for ease in understanding. With carefull thought and interdisciplinary teamwork, these deficiencies may be corrected and conceptual models transformed into useful tools for river quality assessment. Examples are presented from a river quality study of the Willamette River, Oregon. (Bell-Cornell)
W76-01006

THE INTEGRATED MULTI-MEDIA POLLUTION MODEL,
Georgetown Univ., Washington, D.C. Dept. of Economics.
I. K. Paik, J. Harrington, Jr., and F. W. McElroy.
Environmental Protection Agency Report EPA-600/5-74-020, February 1974. 259 p, 14 fig, 25 tab, 54 ref, append.

Descriptors: *Environment, *Resources, *Management, *Model studies, *Pollution abatement, Land use, Simulation analysis, Computer programs, Economics, Waste water treatment, Wastes, Diffusion, Water pollution, Rivers, Biochemical oxygen demand, Dissolved oxygen, Industries, Pollutants, Air pollution, Equations, Systems analysis, Planning.
Identifiers: *Steady-state model, *Environmental quality control, Nonlinearity, Residual management submodel, Dispersion submodel, *Integrated Multi-Media Pollution Model, Land use submodel, Metropolitan regions.

The primary objective was to develop a prototype multi-pollution model for a typical metropolitan region. The basic design and some of the results of initial testing of the model are presented. The Integrated Multi-Media Pollution Model, IMMP, views environmental pollution as a set of in terrelated problems -- the solution of which requires examination of all types of pollution jointly and simultaneously -- and attempts to seek an overall solution to environmental resouce management. Specifically, the model embodies the trade-offs among different forms of residuals disposed finally in the environment that are effected by alternative land use policies, production processes, pollution control strategies and methods. Thus, the Land Use submodel relates various land use policies to the distribution of the sources of environmental pollution. The Residuals Management submodel relates alternative levels of pollution generating activities, input mixes, production processes of various activities, and the alternative treatment processes associated therewith to the magnitude, composition and distribution of pollutants. The Disposal-Dispersion submodel relates pollution emissions at source to (ambient) environmental quality at destination. The model provides a comprehensive framework in which to test and evaluate a wide range of strategies for planning, managing and controlling environmental resources. (Bell-Cornell)
W76-01013

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B.
W76-01031

IMPACT OF NITRATE FERTILIZER RESTRICTIONS ON SALT RIVER PROJECT AND ROOSEVELT WATER CONSERVATION DISTRICT GROWERS,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5C.
W76-01114

SALINITY POLICY FOR COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerboe, and W. R. Walker.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY8, p 1067-1075, August, 1975. 1 fig, 13 ref.

Descriptors: *Salinity, *Colorado River, *Water policy, *Water quality control, *Water law, Water pollution, Saline water, Salts, Irrigation water, Desalination, Colorado River Basin, Colorado River Compact, Mexican Water Treaty, Water resources, Mexico, Water supply, Impared water quality, Costs, Arizona, California, Water management(Applied).
Identifiers: *Salinity control.

Increasing salinity concentrations in the Colorado River are threatening the utility of water resources in the downstream areas of Arizona, California, and the Republic of Mexico. The U.S. Environmental Protection Agency reports that existing damages to lower basin users would increase from $16,000,000 annually in 1970 to $51,000,000 annually by the turn of the century if planned developments do not include appropriate salinity control measure. A brief description of the most important salinity control measures is given along with a short summary of the Colorado River Compact, the Upper Colorado River Compact, and the Mexican Water Treaty. The water quality goal for the Colorado River to maintaining salinity concentrations in the lower stem at or below present levels would be better than setting numerical standards. This policy should be applied to each state by offsetting salinity detriments resulting from each new development with salinity control measures that will maintain a net salt balance leaving state boundaries. (Robinett-Arizona)
W76-01126

SUBMERSIBLE OIL BOOM,
Submarine Engineering Associates, Inc., Cohasset, Mass. (assignee).
R. A. Benson.
U. S. Patent No 3,859,796, 6 p, 14 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 930, No 2, p 622, January 14, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, *Water pollution control, Equipment, Barriers, Water quality control.
Identifiers: *Pollution prevention, Oil booms, Submersible oil booms.

An oil containment barrier or boom is made up of submersible barrier sections, each comprising a vertical dam, preferably at least 1/4 inch thick constructed of elastic, resilently stretchable, solid, plastic, rubberlike material having Shore A scale durometer hardness between 60 and 90 and resiliently deformable in all directions. Each submersible flotation element has an outer shell, preferably elastically and resiliently deformable in all directions. Although the shell may be charged with air or water to float or sink it, it is preferred that resiliently expandable and compressible gas-filled flotation means, perferably a closed cell plastic foam material or a sealed, gas-filled collapsible tube or gas-filled compressible spheres or other such elements, be employed to float the barrier section when expanded for fail-safe operation, together with operating means, such as a collapsible hollow operating tube, or simply the remaining volume within the shell itself, for compressing the gas-filled flotation means to sink the barrier section. (Sinha-OEIS)
W76-01131

DEPLOYABLE SYSTEM FOR CONTAINING OIL SPILLS,
E. N. Fisher.
U.S. Patent No 3,863,694, 4 p, 13 fig, 5 ref; Official Gazette of the uUnited States Patent Office, Vol 931, No 1, p 154, February 4, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, *Water pollution control, Equipment, Storage tanks, Soil management.
Identifiers: *Pollution prevention.

A system is described for containing oil spills or leaks from small oil storage tanks. The system comprises a diaphragm of polyvinyl chloride, synthetic rubber or the like, formed in a circular pattern of radius approximately equal to the radius of the storage tank plus its height. The circular diaphragm is placed under the tank and centered with respect thereto. The edge of the diaphragm is pleated and fastened to a tension ring which surrounds the upper part of the tank and is held in place by friction or other suitable means. When a leak occurs, the tension ring releases and slides down the tank as the diaphragm fills with escaping oil. The deployment of the diaphragm, which can be seen from many miles, particularly from the air, serves as a visual indication that a leak has occurred; in the fully deployed condition, the diaphragm is capable of containing the entire contents of the oil storage tank. The use of the deploy-

e diaphragm oil containment system prevents l, water and air pollution, substantial financial s due to unrecoverable fuel oil, and personal rdship resulting from the failure of a bulk oil oage tank. (Sinha-OEIS)
76-01133

EVALUATION OF ARTIFICIAL STRATIFICATION FOR CONTROL OF GAL BLOOMS,
tra Tech, Inc., Lafayette, Calif.
r primary bibliographic entry see Field 5C.
76-01147

E OF WATERHYACINTHS TO REMOVE TROGEN AND PHOSPHORUS FROM TROPHIC WATERS,
uisiana Agricultural Experiment Station, Baton uge.
r primary bibliographic entry see Field 5C.
76-01148

OPAGATION OF SPARTINA ALTER-FLORA FOR SUBSTRATE STABILIZATION ND SALT MARSH DEVELOPMENT,
rth Carolina State Univ., Raleigh.
r primary bibliographic entry see Field 2L.
76-01169

YDROGEOLOGY ALONG THE PROPOSED ARRIER-RECHARGE-WELL ALINEMENT IN OUTHERN NASSAU COUNTY, LONG LAND, NEW YORK,
eological Survey, Mineola, N. Y.
r primary bibliographic entry see Field 4B.
76-01184

EVELOPMENT DOCUMENT FOR EFFLUENT IMITATIONS GUIDELINES AND NEW OURCE PERFORMANCE STANDARDS FOR HE BAUXITE REFINING SUBCATEGARY OF HE ALUMINUM SEGMENT OF THE NON-ERROUS METALS MANUFACTURING POINT OURCE CATEGORY,
nvironmental Protection Agency, Washington .C. Effluent Guidelines Div.
. S. Thompson, Jr.
vailable from the National Technical Informa-on Service, Springfield, Va 22161, as PB-238 463, .00 in paper copy, $2.25 in microfiche. EPA Re-ort 440/1-74-019-c, March 1974. 99 p, 8 fig, 14 ref, tab. 68-01-1518.

escriptors: *Aluminum, *Waste water treatment, Water pollution treatment, Wastes, Industrial astes, Water pollution sources, Water quality ontrol, Water quality, Capital costs, Operating osts, Costs, Metals, Water purification, conomics, Standards, Effluents, Water quality andards, Regulation, Metallurgy.
lentifiers: *Bauxite, Ores.

study of the bauxite refining industry led to the evelopment of effluent limitation guides and andards of performance for the industry. Ef-uent limitation guidelines presented set forth the egree of effluent reduction attainable through the pplication of the best practicable control chnology currently available and the best availa-le technology economically achievable, which ust be implemented by existing point sources by ly 1, 1977, and July 1, 1983, respectively. Refin-g processes, wastes, and waste treatment rocesses and their costs are discussed. (Witt-IPC)
76-01201

EVELOPMENT DOCUMENT FOR EFFLUENT IMITATIONS GUIDELINES AND NEW OURCE PERFORMANCE STANDARDS FOR HE TIRE AND SYNTHETIC SEGMENT OF THE RUBBER PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
J. E. Riley.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 609, $5.00 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-013-a February, 1974. 193 p, 12 fig, 30 ref, 43 tab. 68-01-1510.

Descriptors: *Waste water treatment, *Rubber, *Water quality standards, Water pollution treatment, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Standards, Economics, Synthetic rubber, Effluents, Regulation, Chemical industry.
Identifiers: *Rubber industry, *Tire industry.

Presented are findings of a study of the tire and inner tube and synthetic rubber segments of the rubber processing industry for the purpose of developing effluent limitations guidelines for the industry. The guidelines set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and through the application of the best available technology economically achievable. The tire and inner tube and synthetic rubber segments of the industry are divided into four subcategories on the basis of the characteristics of the manufacturing processes involved. Separate effluent limitations are developed for each category on the basis of the level of raw waste load, as well as on the degree of treatment achievable by the suggested model systems. These systems include both biological and physical/chemical treatment, and for the synthetic rubber subcategories treatment of the secondary effluent by carbon adsorption. Supportive data and the rationale for development of the proposed effluent limitation guidelines and standards are discussed. Manufacturing processes, wastes, and waste treatment processes and costs are described. (Witt-IPC)
W76-01202

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SOAP AND DETERGENT MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
R. T. Gregg
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 613, $7.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-018-a, April, 1974. 213 p, 37 fig, 70 ref, 6 tab. 69-01-1517.

Descriptors: *Detergents, *Soaps, *Waste water treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Chemical industry, Chemical wastes, Ecnomics, Chemical industi, Effluents, Regulation.

Findings are presented of an extensive study of the soap and detergent manufacturing industry for the purpose of developing effluent limitation guidelines, Federal standards of performance, and pretreatment standards for the industry. The development of data and recommendations relate to the 19 subcategories into which the industry is divided on the basis of raw waste loads and appropriate control and treatment technology. Separate effluent limitations are proposed for each subcategory on the basis of raw waste load control and end-of-pipe treatment achievable by suggested model systems. Supportive data and rationale for development of the proposed effluent limitation guidelines and standards of performance are presented. Potential approaches for achieving the limitation levels and their associated costs are discussed. (Witt-IPC)
W76-01203

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR NEW SOURCES. BEET SUGAR PROCESSING SUBCATEGORY OF THE SUGAR PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
R. V. Watkins.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 462, $6.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-002-b, January, 1974. 172 p, 15 fig, 8 tab, 109 ref.

Descriptors: *Sugar beets, *Waste water treatment, *Water quality standards, Water pollution treatment, Wastes, Industrial wastes, Water pollution sources, Capital costs, Operating costs, Costs, Economics, Water quality, Standards, Carbohydrates, Effluents, Regulation.
Identifiers: *Sugar refining, *Sugar industry.

Findings are presented of a study of the beet sugar processing industry for the purpose of developing effluent limitation guidelines for the industry. The guidelines set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the best available technology economically achievable. Supportive data and rational for development of the effluent limitation guidelines and standards are presented, and processing and refining operations, wastes, and waste treatment processes and costs are described. (Witt-IPC)
W76-01204

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE MAJOR INORGANIC PRODUCTS SEGMENT OF THE INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W76-01205

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE RED MEAT PROCESSING SEGMENTS OF THE MEAT PRODUCTS AND RENDERING PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W76-01206

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE MILLS POINT SOURCE CATEGORY,
Enivronmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W76-01207

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS - FEEDLOTS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
J. D. Denit.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 651,

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$9.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-004-a, January, 1974. 329 p, 68 fig, 257 ref, 40 tab. 68-01-0595.

Descriptors: *Feed lots, *Farm wastes, *Waste water treatment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Water pollution, Water pollution control, Water quality, Waste treatment, Costs, Capital costs, Operating costs, Domestic animals, Cattle, Sheep, Ducks(Domestic), Hogs, Poultry, Liquid wastes, Solid wastes, Waste disposal, Effluents, Regulation.
Identifiers: Turkeys, Chickens, Beef cattle, Dairy cattle, Horses.

Findings are reported of an extensive study of the feedlot industry for the purpose of developing effluent limitation guidelines and standards for the industry. Feedlots for the following animal types were considered in this study: beef cattle, dairy cattle, swine, chickens, turkeys, sheep, ducks, and horses. Guidelines are set forth for effluent reduction attainable through the application of the best practicable control technology currently available and the best avialable technology economically achievable by July 1, 1977, and July 1, 1983, respectively. Supportive data and rationale for development of the proposed guidelines are included. Wastes and waste treatment processes and their costs are discussed. (Witt-IPC)
W76-01208

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SYNTHETIC RESINS SEGMENT OF THE PLASTICS AND SYNTHETIC MATERIALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
D. L. Becker.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-239 241, $8.00 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-010-a, March, 1974. 252 p, 40 fig, 78 ref, 46 tab. 68-01-1500.

Descriptors: *Industrial wastes, *Waste water treatment, *Water quality standards, Water pollution treatment, Wastes, Water pollution sources, Water quality control, Water pollution, Water pollution control, Waste treatment, Costs, Operating costs, Capital costs, Resins, Plastics, Regulation.
Identifiers: *Plastics industry.

Findings are presented of an extensive study of the synthetic resin segment of the plastics and synthetics industry for the purpose of developing effluent limitation guidelines and standards. Guidelines and standards were developed for the following major products: acrylonitrile-butadiene-styrene/styrene-acrylonitrile resin, acrylics, cellophane, cellulose acetate, high- and low-density polyethylene, Nylon 6 and 66, polyester, polypropylene, polystyrene, polyvinyl acetate, polyvinyl chloride, and rayon. Effluent guidelines presented set forth the degree of reduction of pollutants in effluents that is attainable through the application of the best practicable control technology currently available and by application of the best available technology ecnomically achievable by existing point sources by July 1, 1977, and July 1, 1983, respectively. Manufacturing processes, wastes, and waste treatment methods and their costs are discussed. (Witt-IPC)
W76-01209

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SMELTING AND SLAG PROCESSING SEGMENTS OF THE FERROALLOY MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
P. W. Diercks.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 650, $6.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-008-a, February 1974. 179 p, 20 fig, 35 ref, 101 tab. 68-01-1527.

Descriptors: *Waste water treatment, *Water pollution treatment, *Water quality standards, *Steel, *Iron, Wastes, Industrial wastes, Water pollution sources, Water quality control, Water pollution, Water pollution control, Water quality, Waste treatment, Costs, Capital costs, Operating costs, Effluents, Regulation, Metallurgy.
Identifiers: *Iron and steel industry, Slags.

For the purpose of establishing effluent limitation guidelines and standards of performance for the ferroalloys industry, the industry has been categorized on the basis of the types of furnaces, air pollution control equipment installed, and water uses. The catergories include open electric furnaces with wet air pollution control devices, covered electric furnaces and other smelting operations with wet air pollution control devices, and slag processing. The effluent limitations to be achieved by July 1, 1977, are based upon the pollution reduction attainable using treatment technologies as presently practiced by the average of the best plants in these categories. The technologies are for the most part based upon end-of-pipe treatment and once-through water usage. The effluent limitations to be achieved by July 1, 1983, are based upon the pollution reduction attainable using control and treatment technologies as presently practiced by the best plant in each category. Costs are given for the various levels of treatment identified for each category and for the attainment of the suggested effluent guidelines. (Witt-IPC)
W76-01210

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE DAIRY PRODUCT PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
R. Gregg.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 835, $6.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-021-a, May, 1974. 174 p, 23 fig, 149 ref, 28 tab. 68-01-1502.

Descriptors: *Dairy industry, *Waste water treatment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution, Water pollution control, Water quality control, Waste treatment, Costs, Operating costs, Capital costs, Food processing industry, Regulation, Effluents.

Findings are presented of an extensive study of the dairy products processing industry for the purpose of developing effluent limitation guidelines, standards, and pretreatment standards for the industry. The guidelines presented set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently avialable and by application of the best available technology ecnomically achievable, which must be implemented by existing plants by July 1, 1977, and July 1, 1983, respectively. The development of data and recommendations relate to the 12 subcategories into which the industry has been divided on the basis of the levels of raw waste loads and appropriate control and treatment technology. Separate effluent limitations are developed for each subcategory on the basis of raw waste load as well as on the degree of treatment and control achievable by the suggested model systems. Supportive data and rationale for development of the proposed effluent limitation guidelines and standards are included. Potential approaches for achieving the reduced pollution loads and their costs are discussed. (Witt-IPC)
W76-01211

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE UNBLEACHED KRAFT AND SEMICHEMICAL PULP SEGMENT OF THE PULP, PAPER, AND PAPERBOARD MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
C. Vogt.
Avialable from the National Technical Information Service, Springfield, Va 22161, as PB-238 833, $10.00 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-025-a, May, 1974. 351 p, 43 fig, 132 ref, 75 tab. 68-01-1514.

Descriptors: *Pulp wastes, *Waste water treatment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution, Water pollution control, Water quaity control, Waste treatment, Pulp and paper industry, Costs, Operating costs, Capital costs, Effluents, Regulation
Identifiers: Kraft mills, Sulfite mills, Board mills.

Findings are presented of a study of the unbleached kraft, semichemical, and paperboard segment of the pulp, paper, and paperboard industry for the purpose of developing effluent limitation guidelines for existing plants and standards of performance for new plants. Effluent limitations are set forth for the degree of effluent reduction attainable through the application of the best practicable control technology currently avialable and the best avialable technology economically achievable, which must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. The identified technology for new sources performance standards is in-plant waste water control and secondary treatment. The identified in-plant controls and external treatment systems are avialable for implementation as they have all been deomonstrated at mills within the subcategories under study. Supporting data and rationale for the development of the effluent limitations and standrds of performance are given. Manufacturing processes, wastes, and waste treatment processes and costs are discussed. (Witt-IPC)
W76-01212

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BASIC FERTILIZERS CHEMICALS SEGMENT OF THE FERTILIZER MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
E. E. Martin.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 652, $6.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-011-a, March, 1974. 175 p, 33 fig, 24 ref, 3 tab. 68-01-1508.

Descriptors: *Waste water treatment, *Fertilizers, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Water pollution, Water pollution control, Water quality, Waste treatment, Costs, Capital costs, Operating costs, Chemical industry, Phosphates, Ammonium compounds, Ureas, Nitrates, Chemical wastes, Inorganic compounds, Effluents, Regulation.
Identifiers: *Fertilizer industry.

Findings are presented of an extensive study of the fertilizer industry for the purpose of develop-

effluent limitation guidelines and standards of
formance and pretreatment standards. The fer-
er industry is divided into five categories for
e meaningful separation and division of waste
er treatment and development of effluent
delines. These subcategories are phosphate,
monia, urea, ammonium nitrate, and nitric acid
ducts. The phosphate subcategory includes all
illary operations necessary for phosphate
duction. Effluent guidelines for best practica-
control technology currently available, best
ilable technology economically achievable, and
source performance standards are recom-
nded for each category. Manufacturing
cesses, wastes, and waste treatment methods
their costs are discussed. (Witt-IPC)
76-01213

VELOPMENT DOCUMENT FOR EFFLUENT
MITATIONS GUIDELINES AND NEW
URCE PERFORMANCE STANDARDS FOR
E STEEL MAKING SEGMENT OF THE
ON AND STEEL MANUFACTURING POINT
URCE CATEGORY,
vironmental Protection Agency, Washington,
. Effluent Guelines Div.
. Dulaney.
ailable from the National Technical Informa-
Service, Springfield, Va 22161, as PB-238 837,
.00 in paper copy, $2.25 in microfiche. EPA Re-
t 440/1-74-024-a, June, 1974. 476 p, 84 fig, 143
79 tab. 68-01-1507.

scriptors: *Waste water treatment, *Steel,
ater quality standards, Wastes, Industrial
ites, Water pollution sources, Water pollution
itment, Water pollution, Water pollution con-
, Water quality control, Waste treatment,
ts, Capital costs, Operating costs, Iron, Metal-
gy.
ntifiers: *Iron and steel industry.

effluent limitation guidelines proposed for the
steel making operations of the iron and steel
ustry set forth the effluent quality attainable
ough the application of the best practicable con-
technology currently available and through ap-
ation of the best available technology economi-
y achievable, which must be achieved by 1977
1983, respectively. Supporting data and ra-
ale for development of the effluent limitation
delines and standards are given. Manufacturing
cesses, wastes, and waste treatment methods
costs are discussed. (Witt-IPC)
6-01214

VELOPMENT DOCUMENT FOR EFFLUENT
MITATIONS GUIDELINES AND NEW
URCE PERFORMANCE STANDARDS FOR
E INSULATION FIBERGLASS MANUFAC-
RING SEGMENT OF THE GLASS MANU-
CTURING POINT SOURCE CATEGORY,
vironmental Protection Agency, Washington,
. Effluent Guidelines Div.
W. Kosakowski.
ailable from the National Technical Informa-
Service, Springfield, Va 22161, as PB-238 078,
0 in paper copy, $2.25 in microfiche. EPA Re-
t 440/1-74-001-b, January, 1974. 105 p, 18 fig,
ef, 19 tab.

criptors: *Waste water treatment, *Water pol-
n treatment, *Water quality standards,
stes, Industrial wastes, Water pollution
rces, Water pollution, Water pollution control,
ter quality control, Waste treatment, Costs,
rating costs, Capital costs, Insulation, Ther-
insulation.
ntifiers: *Glass industry, Fiberglass.

dings are presented of an extensive study of
rglass insulation manufacturing for the pur-
e of developing effluent limitation guidelines.
guidelines set forth the degree of effluent
uction attainable through the application of the
practicable control technology currently
availabe and with the best available technology economically achievable, which must be achieved by existing plants by 1977 and 1983, respectively. Supportive data and rationale for development of the proposed effluent limitation guidelines are presented. Manufacturing processes, wastes, and waste treatment processes and costs are discussed. (Witt-IPC)
W76-01215

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE APPLE, CITRUS, AND POTATO PROCESSING SEGMENT OF THE CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
J. D. Gallup.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 649, $7.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-027-a, March, 1974. 228 p, 9 fig, 34 ref, 44 tab. 68-01-1528.

Descriptors: *Food processing industry, *Canneries, *Waste water treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Waste treatment, Citrus fruits, Apples, Potatoes, Water pollution treatment, Economics, Standards, Irrigation, Water reuse, Biological treatment, Effluents, Regulation.

A study was made of the apple, citrus, and potato processing segment of the canned and preserved fruits and vegetables industry for the purpose of developing waste water limitation guidelines. The guidelines set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the best available technology economically achievable, which must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. Land treatment systems, such as spray or flood irrigation, are effective and economic alternatives to the biological systems described. When suitable land is available, spray or flood irrigation are preferred to biological treatment. Processes, wastes, and waste treatment methods and their costs are discussed. (Witt-IPC)
W76-01216

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BUILDING, CONSTRUCTION, AND PAPER SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environemental Protection Agency, Washington, D.C. Effluent Guidelines Div.
R. J. Carton.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 320, $6.00 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-017-a, February, 1974. 142 p, 15 fig, 27 ref, 9 tab. 68-01-1505.

Descriptors: *Waste water treatment, *Asbestos, *Asbestos cement, *Pulp wastes, *Water quality standards, Industrial wastes, Wastes, Water pollution treatment, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Waste treatment, Roofing materials, Pipes, Tiles, Concrete pipes, Construction materials, Effluents.

Findings are presented of an extensive study of a segment of the asbestos manufacturing industry for the purpose of developing effluent limitation guidelines. Separate effluent limitation guidelines are developed for the asbestos-cement pipe, asbestos-cement sheet, asbestos paper (with starch and elastomeric binders). asbestos millboard, asbestos roofing, and asbestos floor tile manufacturing segments of the asbestos industry on the basis of treatment achievable by suggested model systems. Supportive data and rationale for development of the proposed effluent limitation guidelines are presented. Manufacturing processes, wastes, and waste treatment processes and costs are discussed. (Witt-IPC)
W76-01217

FILTER BELT OIL RECOVERY SYSTEM,
Martin Marietta Aerospace, Denver, Colo. Denver Div.
R. O. Moses, and S. L. Blackstone.
Available from the National Technical Information Service, Springfield, Va 22161, as AD A0-03831, $9.75 in paper copy, $2.25 in microfiche. U.S. Coast Guard Report CG-D-82-74, December, 1971. 316 p, 155 fig, 4 ref, 25 tab.

Descriptors: *Oil spills, *Water pollution treatment, *Sea water, Water pollution sources, Oil pollution, Oil wastes. Water pollution, Water pollution control, Performance, Engineering, Filters, Testing, Design, Powerplants, Equipment, Prototypes, Filtration, Separation techniques.

The results of a systems development program (Phase I) for preliminary design of an ocean oil spill recovery system are presented. The design goal of the system is to recover and offload up to 2000 gpm of spilled oil and to operate in waves up to 5 ft in average height. The recovery system consists of an oil-recovery device mounted on a catamaran boat hull and an oil-transfer system mounted within the boat hull to offload the recovered oil. Oil is recovered by a porous oleophilic belt that performs basically as a fluid/fluid filter. The filter recovers oil from the surface of the water, filters out the excess water, and conveys the oil to squeeze rolls where the oil is extracted. Basic filter material performance testing, filter belt development, model testing, subsystem (oil recovery, oil transfer, and auxiliary power subsystems) requirements, and preliminary design are described. (Witt-IPC)
W76-01222

INDUSTRY WASTE STUDY. THE HAWAII SUGAR INDUSTRY WASTE STUDY.
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5B.
W76-01224

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, PHASE II, APPENDIX I. DESIGN STUDIES AND SPECIFICATIONS,
Ocean Systems, Inc., Reston, Va.
R. L. Beach, F. A. March, L. S. Brown, T. S. McMahon, and J. Papp.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-003 934, $6.00 in paper copy, $2.25 in microfiche. U.S. Coast Guard Report No CG-D-84-74, April, 1974. 180 p, 7 fig, 9 tab.

Descriptors: *Oil spills, *Equipment, *Sea water, *Water pollution treatment, Design, Specifications, Water pollution sources, Oil production, Oil wastes, Water pollutio, Construction, Testing, Prototypes, Research and development, Powerplants, Pressure, Hoses, Oil, Oceans, Construction materials, Pumps.

A prototype oil spill recovery system has been designed and constructed. The initial part of this report describes studies carried out to compare and evaluate materials (acrylonitrile-butadiene-styrene, aluminum, polyester/glass laminate, polyvinyl chloride, plywood, polycarbonate, and Royalex, and acrylonitrile-butadiene-styrene/vinyl foam laminate) for their potential use in rigid elements of the weir/basin, the pressure drop for dif-

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ferent oil transfer hose configurations, and alternative ways of deploying and recovering the oil recovery apparatus. The latter part of this report gives specifications for construction and specific components of the apparatus, including the power supply system. (See also W76-01226 and W76-01227) (Witt-IPC)
W76-01225

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, PHASE II, APPENDIX II. MATERIALS AND COMPONENT TESTS,
Ocean Systems, Inc., Reston, Va.
R. L. Beach, F. A. March, L. S. Brown, T. S. McMahon, and J. Papp.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 946, $7.75 in paper copy, $2.25 in microfiche. U.S. Coast Guard Report No CG-D-84-74, April, 1974. 232 p, 52 fig, 44 tab.

Descriptors: *Oil spills, *Sea water, *Water pollution treatment, *Prototype tests, *Equipment, Oil, Oceans, Fabrics, Coatings, Adhesives, Testing, Joints(Connections), Prototypes, Construction materials, Loads(Forces), Strength, Mechanical properties, Pump testing, Control systems, Water pollution sources, Weirs, Oil pollution, Pumps.

A prototype oil spill recovery system has been designed and constructed. This report describes tests of the subsystems and components, including tests with a full-scale model of the secondary weir using 4 different weight oils, the oil resistance of fabrics, coatings, adhesives, mechanical joints, and construction materials, maximum expected load on the intermediate flotation section, strength of foam stiffeners used to connect the intermediate flotation sections to the secondary weir, secondary weir pump suction manifold, control system, and the oil-water interface sensor. (See also W76-01225 and W76-01227) (Witt-IPC)
W76-01226

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, PHASE II, APPENDIX III. SYSTEM TESTS,
Ocean Systems, Inc., Reston, Va.
R. L. Beach, F. A. March, L. S. Brown, T. S. McMahon, and J. Papp.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 947, $9.25 in paper copy, $2.25 in microfiche. U.S. Coast Guard Report No CG-D-84-74, April, 1974. 308 p, 29 fig, 14 tab.

Descriptors: *Prototype tests, *Water pollution treatment, *Oil spills, *Equipment, Water pollution sources, Oil pollution, Oil wastes, Water pollution, Prototypes, Testing, Oil, Oceans, Pumping, On-site tests, Performance, Pump testing, Pumps.

A prototype oil spill recovery system has been designed and constructed. This report describes tests to determine the operability and preliminary operating parameters of the transfer pumping system. The tests included water pumping, viscous oil (3500 cp) pumping, and viscous oil pumping with simultaneous water injection into the suction manifold. Oil-recovery tests in a large pond at Richland, Washington are described. The tests utilized light and heavy fuel oils in calm water and 2 ft waves, with tow speeds to 2.76 knots. Procedures for at-sea tests are outlined. (See also W76-01225 and W76-01226) (Witt-IPC)
W76-01227

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SECONDARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
G. S. Thompson, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 464, $6.00 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-019-e, March, 1974. 131 p, 9 fig, 20 ref, 29 tab.68-01-1518.

Descriptors: *Aluminum, *Waste water treatment, *Water quality standards, Water pollution treatment, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Capital costs, Operating costs, Metals, Aluminum alloys, Cooling water, Water pollution, Water pollution control, Water quality, Standards, Economics, Metallurgy, Effluents, Regulation.

An extensive study of the secondary aluminum smelting industry was conducted for the purpose of developing effluent limitation guidelines and standards of performance. The guidelines set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and attainable with the application of the best available technology economically achievable. The development of data and recommendations relate to waste waters generated in metal cooling, fume srubbing, and wet residue processing. The best practicable control technology currently available, the best available technology economically achievable, and the best available demonstrated control technology for each of these waste water streams are presented. The effluent limitations and standards of performance corresponding to these technologies also are presented. Supporting data and rationale for development of the effluent limitation guidelines and standards of performance are included. Costs are estimated. (Witt-IPC)
W76-01231

EFFICIENCY OF OIL SPILL REMOVERS,
For primary bibliographic entry see Field 5D.
W76-01232

EXPERIMENTAL PROTOTYPE OILY WASTEWATER TREATMENT SYSTEM.
Holt (Ben) Co., Pasadena, Calif.
For primary bibliographic entry see Field 5D.
W76-01236

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR THE CATFISH, CRAB, SHRIMP AND TUNA SEGMENTS OF THE CANNED AND PRESERVED SEAFOOD PROCESSING INDUSTRY POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
E. H. Forsht.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 614, $10.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-020-a, June 1974. 399 p, 65 fig, 345 ref, 119 tab. 68-01-1526.

Descriptors: *Food processing industry, *Waste water treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Fish, Catfishes, Crabs, Shrimp, Evaluation, Economics, Standards, Water pollution treatment, Effluents, Regulation.
Identifiers: *Seafood, Tuna.

Findings are presented of a study of the seafood processing industry for the purpose of developing effluent limitation guidelines. The seafood processing plants included in this study were those processing farm raised catfish crab shrimp, and tuna. Effluent limitation guidelines are presented for the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the best available technology economically achievable which must be implemented by existing point sources by July 1, 1977, and July 1, 1983 respectively. Supportive data and rationale and rationale for development of the effluent limitation guidelines and standards of performance are presented. Processing techniques, wastes, and waste treatment methods and their costs are discussed (Witt-IPC)
W76-01237

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PETROLEUM REFINING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
M. Halper.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 612, $7.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-014-a, April, 1974. 209 p, 7 fig, 75 ref, 57 tab. 68-01-0598.

Descriptors: *Oil industry, *Waste water treatment, *Water quality standards, Water pollution control, Capital costs, Operating costs, Costs, Wastes, Industrial wastes, Water pollution sources, Water quality, Standards, Economics, Effluent, Regulation.
Identifiers: *Petroleum refining.

A study of the petroleum refining industry led to the development of effluent limitation guidelines, standards of performance, and pretreatment standards for the industry. The effluent limitation guidelines presented set forth the degree of reduction of pollutants in effluents that is attainable through the application of the best practicable control technology currently available and through the application of the best available technology economically achievable, which must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. Annual costs to the petroleum refining industry for achieving these levels of pollution reduction are estimated. Supporting data and rationale for the development of the proposed effluent limitation guidelines and standards of performance are given. (Witt-IPC)
W76-01238

HYDROGEOLOGIC EVALUATION OF SOLID WASTE DISPOSAL IN SOUTH CENTRAL WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
A. Zaporozec.
Technical Bulletin No 78, 1974. 32 p, 5 fig, 9 tab, 20 ref, 1 append.

Descriptors: *Solid wastes, *Landfills, *Sites, *Wisconsin, Hydrogeology, Leachate, Waste disposal, Environmental effects, On-site investigations, Evaluation, Groundwater, Water table, Soils, Garbage dumps, Water pollution sources, Water pollution control, Geologic control, Groundwater movement, Permeability, Topography, Groundwater recharge, Classification.
Identifiers: *Criteria, Guidelines.

The conditions of 62 solid waste disposal sites in 10 counties of south central Wisconsin were examined. The evaluation concentrated on physical environments of the existing land disposal sites and their potential for pollution of water resources. Generally, the physical environment offers good natural protection against undesirable effects of landfilling. Landfills can be constructed in almost any of the hydrogeologic environments in south central Wisconsin, provided that a suita-

l design is used for each particular environment. ypical hydrogeologic environments were ntified and classified into 10 groups. Three fac- s were used for the classification of drogeologic environments: (1) the extent and aracter of surficial deposits, (2) the position of site in the ground water flow system, and (3) pth to water table. A set of criteria useful in sit- sanitary landfills in south central Wisconsin s established and examined on a number of sites see how the criteria related to local conditions. e criteria used were: (1) type of unconsolidated diments, (2) thickness of unconsolidated sedi- nts, (3) depth to water table, (4) position of the e in the ground water flow, (5) type of bedrock, d (6) topography. Data needed for the evaluation a site and the rating of their importance, along h a suggested procedure for evaluating environ- ntal impact, were presented. (Visocky-ISWS) 76-01273

CHNICAL AND ECONOMIC OPTIMIZA- ON OF REGIONAL WASTEWATER ANAGEMENT (TECHNISCHE UND IRTSCHAFTLICHE OPERIMIERUNG BEI ER BILDUNG VON ZWECKVERBAENDEN R ABWASSERBESEITIGUNG),
H. Hahn, and P. M. Meier.
axis der Umwelthygiene, Vol 5, p 352-368, 1972. ig, 1 tab, 14 ref. (Presented at the International ongress PRO AQUA-PRO VITA, Basel, Switzerland, 1971).

escriptors: *Mathematical models, *Treatment cilities, Construction, Hydraulic transportation, near programming, Networks, Water resources velopment, Cost analysis.
entifiers: Regional waste water management.

rational method for the optimization of regional aste water management systems is developed on e basis of a mathematical model and its subquent optimization using modern techniques of erations research. However, the economies of ale in interceptor and treatment facility conuction and the nonlinearity of hydraulic pipe w regimes preclude optimization by conven- nal mathematical programming, since the result- g objective functions are concave. Well proven ethods such as linear programming or solution graph-theoretical analysis are thus inappropriate. Formulation as a fixed-charge problem sults in a mixed interger-continuous variable ear programming problem, for which solution gorithms are to date insufficiently proven for neral application. Solutions proposed generally ploit the unique structure of the location oblem, yet hydraulic transportation networks nnot be treated by such existing methods. An plicit enumeration scheme is proposed to locate e optimum solution utilizing a branch and bound ethod as a search strategy. Preliminary results mpare favorably to the traditional expedient of quential technical and economic analysis, hereby a prior selection of feasible solutions is termined on the basis of empirical engineering dgment and subsequently subjected to cost anal- is. (Sandoski-FIRL) 76-01277

ISPOSAL OF DOMESTIC WASTEWATER BY ILLSIDE SPRAYS,
alifornia State Dept. of Public Health, Berkeley. ureau of Sanitary Engineering.
or primary bibliographic entry see Field 5E. 76-01295

ATER RESOURCES PLANNING,
or primary bibliographic entry see Field 6B. 76-01328

ENVIRONMENTAL IMPACT STATEMENTS IN PLANNING WATER AND RELATED LAND RESOURCES,
State Univ. of New York at Syracuse. Coll. of Environmental Sciences and Forestry.
For primary bibliographic entry see Field 6G.
W76-01333

STOCHASTIC ANALYSIS AND CONTROL OF URBAN ESTUARINE WATER-QUALITY SYSTEMS: VOL I--ESTIMATION AND PREDICTION,
New York City, Rand Inst. N.Y.
S. K. Liu.
R-1622-NYC, The New York City Rand Institute, New York, December 1974. 47 fig, 7 tab, 114 equ, 27 ref, 4 appen, 110 p.

Descriptors: *Water quality control, *Estuarine environment, *Urban hydrology, *Urban drainage, *Stochastic processes, *Estimating, *Simulation analysis, Behavior, Drainage systems, Storm water, Water quantity, Pollutants, Overflow, Coliforms, Mathematical models, Equations, Systems analysis, Fourier analysis, *Forecasting.
Identifiers: Jamaica Bay(New York), Nonparametric cross-spectral method, Stochastic noise components.

Described are the interrelationships among the major components of a typical urban estuarine interactive water-quality system. The nonparametric cross-spectral method was used to analyze the responsive behavior between the rainfall and the quantity and quality of the resulting overflow, as well as the characteristics of the stochastic noise components of several drainage systems. All impulse response kernels of the resulting overflow pollutant concentration had a basic W-shaped curve, indicating the relative importance of surface washing, conduit dilution, and bottom scouring. An equation for predicting transient coliform densities in a storm/sanitary combined system overflow was derived based on the interrelationship between the quantity and quality of the internal flow system. The prediction function from rainfall to overflow estimated by the spectral method was also compared with that obtained by direct transformation using the fast Fourier transform method. The prediction functions and coliform equations were used to develop urban drainage models for estimating the quantity and quality of discharges from the peripheral drainage systems of Jamaica Bay, New York City. These models were then used (with a two-dimensional estuarine water-quality model of the bay) for simulating water-quality results from two summer storms occurring during 1972 and 1973. Control processes in urban estuarine water-quality systems should be based upon a feed-forward scheme that uses predictive functions, since most of the parameters governing control are not measurable in real time. (Bell-Cornell)
W76-01340

WATER QUALITY AND RESOURCES PLANNING MUST BE UNITED,
Gilbert J.B. and Associates, Berkeley, Calif.
J. B. Gilbert, and W. J. Miller.
Water and Wastes Engineering, Vol 12, No 2, p 20-23, February 1975. 4 fig.

Descriptors: *Water quality, Water resources, *Water management(Applied), *Water management(Administrative), *Water pollution, *Water supply, Streamflow, Salinity, Irrigation water, Groundwater, Algae, Fish migration, Reservoirs, River basin development, *California, Planning, Colorado River, Federal Water Pollution Control Act.
Identifiers: *San Joaquin River(Calif), *San Francisco Bay(Calif), *Sacramento-San Joaquin Delta(Calif), *Livermore Valley(Calif), *Alameda Creek(Calif), Niles Cone groundwater basin(Calif), Peripheral Canal(Calif).

In the United States water quality and water resources management have largely been undertaken separately. In times of water shortage, integration of these two study areas is needed to insure water supplies. Examples of water management involving San Francisco Bay and Sacramento-San Joaquin Delta (Calif), the Colorado River (Calif), the San Joaquin River (Calif), and Livermore Valley (Calif) are cited. In the latter case wastewater flows with concentrations of 700 to 1000 mg/l of salt occur in Alameda Creek (Calif) after municipal/industrial use adds 400 to 500 mg/l of salt to the water. During the dry season this has a detrimental effect on the Niles Cone groundwater basin downstream and would eventually degrade these waters. The best solution appears to be to build a reservoir to store salty waters to be released in times of high streamflow. A water quality problem is thus solved through water resource management. Efforts at unification of these management fields have been made by the National Water Commission, the Federal Water Pollution Act of 1972, Interim Basin Planning in California, the California State Water Resources Control Board and the Federal Bureau of Reclamation. The Federal Water Pollution Control Act Amendments of 1972 should be strengthened, or water resources and water quality planning should be undertaken by the Environmental Protection Administration, the Bureau of Reclamation and the Corps of Engineers. Also, state efforts, amendments to federal law, and expansion of state water rights authority are needed. (Smith-North Carolina)
W76-01343

PRIORITIES IN WATER MANAGEMENT.
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W76-01347

ENVIRONMENTAL HAZARDS OF LARGE SCALE WATER DEVELOPMENTS,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6G.
W76-01348

RESEARCH ISSUES IN WATER QUALITY MANAGEMENT,
British Columbia Univ., Vancouver. Westwater Research Centre.
A. H. J. Dorcey, and I. K. Fox.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 63-77, 1 fig, 1 tab, 13 ref. 1974.

Descriptors: *Research and development, *Comprehensive planning, Water resources development, *Research priorities, *Multi-purpose projects, Political aspects, *Institutional constraints, Management, Waterquality, *Canada.
Identifiers: Water quality management, *Lower Fraser River Research Project(Canada).

The usefulness of much of the research on the design of appropriate policies and institutional arrangements for water quality management is questioned. Some major limitations in research are suggested and several types of research that appear to merit greater emphasis are proposed. Some neglected proposals include: (1) the establishment of regional agencies; (2) utilization of effluent charges; (3) development of better techniques for evaluating alternative solutions; and (4) the integration of water quality management into the general task of residuals management. Decision makers follow more politically satisfying policies such as increased national management and national standards, limited regulations, and increased subsidies to induce desired behavior by waste discharges. To bridge the gap between research and policy making, new directions in research must be taken: larger number of inter-

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disciplinary studies of regional situations, studies on behavioral aspects of water quality management, and inclusion of problem perceptions of the public and official decision makers in research designs. The Lower Fraser River Research Project provides a model of communication between the research team and various water quality management interests. The study outlines physical, behavioral, economic and technical properties to be used with normative criteria to evaluate existing institutional arrangements for water quality management, formulate improvements and evaluate alternative institutional designs. (See also W76-01347) (Salzman-North Carolina)
W76-01351

DECISION TO CONTROL EUTROPHICATION,
Canada Centre for Inland Waters. Burlington (Ontario).
T. R. Lee.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 79-97, 1 fig, 2 tab, 36 ref. 1974.

Descriptors: *Planning, *Water quality standards, Water policy, *International Joint Commission, *International commissions, *Great Lakes Region, *Eutrophication, *Phosphorous compounds, Water quality, Federal government, Great Lakes, Canada, United States, *Nitrilotriacetic acid.
Identifiers: Water quality management.

Following the issuance of a report which disclosed that phosphorous caused high levels of eutrophication in the Lower Great Lakes, the International Joint Commission (IJC) recommended specific water quality objectives which called for more public participation in the decision-making process and more public control of water quality. Subsequent events and constraints that exist on the authority of international institutions are discussed. The IJC advised public regulation of industry for the preservation of environmental quality. Although much of the IJC's report was supported on both sides of the lakes, divergences appeared between the U.S. and Canada concerning enforcement of the recommendations and emphasized the lack of authority in an international water management agency. As Canada quickly banned the manufacture, use, sale or import of phosphorous, the U.S. took no action, allowing the Great Lake states to legislate their own programs. A substitute, tri-sodium salt of nitrilotriacetic acid (NTA) was recommended by the commission and accepted for use by Canada; again, the U.S. refused support claiming that all environmental effects of NTA were unknown. Failure to agree on management strategies and water quality standards emphasized the opinion conflict between the two countries. The relationship between management of environmental quality and the decision-making structures needs examination. The eutrophication question suggests that the IJC has not been a suitable model for international environmental management. (See also W76-01347) (Salzman-North Carolina)
W76-01352

USER RESPONSE TO WATER QUALITY AND WATER-BASED RECREATION IN THE QU'APPELLE VALLEY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
J. G. M. Parkes.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 99-112, 2 fig, 8 tab, 8 ref. 1974.

Descriptors: Planning, *Future planning, *Decision making, Social aspects, *Non-structural alternatives, *Water quality control, *Attitudes, *Recreation, Research priorities, Water management, Behavior, *Canada.
Identifiers: Qu'Appelle Lakes(Saskatchewan), Saskatchewan.

A perception and attitude study which measures the behavioral response of a population to a specific set of phenomena can aid in assessing public views and in helping to estimate social costs incurred by changes in the environment. This study of 4 recreational Qu'Appelle Valley lakes and their adjacent areas examines how present level of water quality influences recreation and determines the extent of people's willingness to pay for improvements in water quality. Two sampling procedures were used: a water quality sampling enabled a comparison to be made over time of the water's physical condition with the public perception of its quality which was ascertained by a sampling of 560 recreation users and 240 shoreline cottage residents. Results indicated that waters met accepted quality criteria. The user survey showed that a high desire for water quality was enough to cause significant reduction in recreational uses. To improve the quality of water, users expressed a willingness to pay a high amount per user per day per season, particularly at lakes with poorest quality. In weighing water use demands against each other and determining optimum water quality levels, the decision-maker can employ user perception and attitudinal studies to aid in the final choice. More research is needed to determine the acceptable water quality criteria for recreation and to assess the value of this type of survey regarding public involvement process in planning. (See also W76-01347) (Salzman-North Carolina)
W76-01353

THE ROLE OF THE PUBLIC IN DECISION-MAKING,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 6B.
W76-01357

WATER POLLUTION LAWS AND REGULATIONS,
Missouri Univ., Columbia. Dept. of Agricultural Ecnomics.
C. G. McNabb, and D. R. Levi.
Science and Technology Guide, Missouri University Columbia Extension Division, May, 1969, 4 p.

Descriptors: *Water pollution control, *Regulations, *Missouri, *Permits, Water law, Legislation, Water policy.
Identifiers: Civil courts, Injunction, Fines.

Two approaches for resolution and prevention of the Missouri water pollution problem are (1) through the Water Pollution Board and (2) through the civil courts. In 1957 the Missouri Legilature established the Water Pollution Board, defined water pollution, and adopted a state water policy which the board must regulate. The board was authorized to take legal action against pollution in a number of ways--by fines, by tax bills, by authorization to the Attorney General to bring suit against violators, and by withholding construction permits when proposed waste treatment facilities are inadequate. A permit was to be required for any person wanting to construct, install, or modify facilities for waste disposal which discharge wastes into waters of the state. A person causing pollution may be sued for (1) an injunction, (2) damages, or (3) both an injunction and damages as a civil remedy to temporary or permanent nuisances. (Battles-East Central Oklahoma State)
W76-01375

LOCATING A NEW FEEDLOT,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 5B.
W76-01383

CURRENT LIVESTOCK POLLUTION REGULATIONS,
L. Lubinus, and F. Kerr.
Cooperative Extension Service, South Dakota State University, Brookings, August 1974, 5 p.

Descriptors: *Water pollution, *Permits, *Livestock, Water quality standards.
Identifiers: *Point source pollution, Technical assistance, Feedlot effluent standards.

Public Law 92-500 amended the Federal Water Pollution Control Act and was enacted October 18, 1972. It prohibits the discharge of pollutants (including livestock wastes) into any stream, lake or river from a point source without a permit issued from one of two offices. These permits are issued by the Federal Environmental Protection Agency's (EPA) regional office in Denver, Colorado, or from the South Dakota Department of Environmental Protection (DEP). The term 'point source' is defined in terms of large and small feeding facilities using the type and number of animals to define the size. The NPDES (National Pollution Discharge Elimination System) is in charge of the permit program at the national level. Instructions of how and where to apply for a permit are given. Feedlot effluent standards, cost-sharing programs and technical assistance are briefly discussed. (Kehl-East Central Oklahoma State)
W76-01385

EPA AND THE LIVESTOCK FEEDER,
National Livestock Feeders Association, Omaha, Nebr.
B. Jones.
Agricultural Engineering, Vol 55, No 3, p 30-31, March, 1974, 2 fig.

Descriptors: *Livestock, *Feed lots, *Water pollution control, *Costs, *Regulation, Runoff, Iowa, Farm wastes.
Identifiers: Tenant farmers.

Livestock operators are faced with many installation and maintenance costs in maintaining adequate pollution control facilities. One of the problems is that such investments are not cost-reducing or production-increasing. An initial installation investment for surface runoff control facilities of over $700 million would be required for beef cattle, hog, lamb and dairy control facilities in the U.S. in order to meet regulations requiring the containment of surface runoff from a 10-year, 24-hr storm. Livestock operators usually must absorb cost increases. The cost of implementing environmental regulations may prove the exception if many producers are forced out of business. (Cartmell-East Central Oklahoma State)
W76-01388

IMPACT OF ENVIRONMENTAL REGULATION ON THE LIVESTOCK INDUSTRY,
National Livestock Feeders Association, Omaha, Nebr.
B. H. Jones.
Presented at 1973 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 11-14, 1973, Paper No 73-5531, American Society of Agricultural Engineers, St. Joseph, Michigan. 9 p.

Descriptors: *Regulation, *Feed lots, *Costs, Livestock, *Farm wastes, *Water quality standards, *Environmental effects.

Proposed guidelines and the effect they could have on the stability of rural economics, production costs, supplies of animal products, and consumer prices are discussed. In terms of price increases and overall industry capacity, the economic impact of the proposed effluent guidelines for feedlots would not be serious. The impact of environmental regulation will fall mostly on the small operator. It is said that many of these will be forced out of business. The industry may be pushed toward the middle of the road in terms of the unit size of operation. It is important to consider that environmental control expenditure does not generate additional cash flow or new income opportunities. Such investments are not cost-

ducing or production-increasing. In fact, they e costtcreating, since they give rise to additional aintenance and other operational costs. Cartmell-East Central Oklahoma State)
76-01389

NFORMER FEES UNDER THE REFUSE ACT: ECIDING WHO GETS WHAT,
or primary bibliographic entry see Field 6E.
76-01392

EPARTMENT OF ENVIRONMENTAL PRO-ECTION V JERSEY CENTRAL POWER AND IGHT CO. (DAMAGES FOR FISH KILL FROM ISCHARGE OF COLD WATER INOT NOR-IALLY WARMED WATER),
or primary bibliographic entry see Field 6E.
76-01394

PTIMAL ENVIRONMENTAL JURISDIC-IONS,
oosevelt Univ., Chicago, Ill.
or primary bibliographic entry see Field 6E.
76-01398

ATIONAL OIL AND HAZARDOUS SUB-TANCES POLLUTION CONTINGENCY PLAN.
ouncil on Environmental Quality, Washington, .C.
ederal Register, Vol 40, No 28, p 6282-6302, ebruary 10, 1975.

escriptors: *Oil spills, *Disasters, Comprehensive planning, *Hazards, Oil wastes, il pollution, Safety, Inter-agency cooperation, oordination, Control, Scheduling, Management, Vater pollution effects, Control systems, Water ollution, Water pollution control, Water pollution ources, Water pollution treatment.
dentifiers: Hazardous spill emergencies, Iazardous substances(Pollution), Administrative egulations, Coastal waters, Contiguous zone, erritorial waters.

his plan provides for a pattern of coordinated and ntegrated response by several departments and gencies of the Federal government to protect the nvironment from the damaging effects of pollu-on discharges. The objective is to provide effi-ient, coordinated and effective action to inimize damage from discharges of oil and other azardous substances, through containment, ispersal and removal. The plan governs the avigable waters of the United States, adjoining horelines, the contiguous zone, and the high seas here a threat to the United States waters, horeface, or shelf-bottom exists. The primary rust of the plan is to provide a coordinated esponse at the scene of an unplanned or sudden ischarge of oil or hazardous substance that hreatens the public health or welfare. Detailed lans are presented concerning each agency or de-artment's role, response, and authority in the vent of an actual emergency. (Hoffman-Florida)
76-01399

PRIMER ON THE BOUNDARY WATERS REATY AND THE INTERNATIONAL JOINT OMMISSION,
or primary bibliographic entry see Field 6E.
76-01400

EGAL REMEDIES FOR POLLUTION ABATE-IENT,
lissouri Univ., Columbia.
. R. Levi, and D. Colyer.
cience, Vol 175, p 1085-1087, March 10, 1972. 30 ef.

escriptors: *Pollution abatement, *Natural esources, *Legal aspects, *Remedies, Environmental effects, *Social aspects, Planning, Pollution, Common law, Industrial wastes, Conservation, Water resources, Administration, Judicial decisions, Preservation, Protection, Legislation, Trespass, Damages, Riparian rights, Prior appropriation.
Identifiers: *Nuisance(Legal aspects), Injunctive relief.

If the exploitation of natural resources is to stop, the legal structure must be conducive to that goal. Legal remedies are available for the use of individuals or groups in attacking specific acts of pollution or proposals deemed destructive to the environment. In disposing of the residues of production and consumption, the polluter makes use of free, often scarce resources including air and water, the costs of which are imposed on society. Because of the multifarious interests involved in the solution of pollution problems, solutions are not reached with optimal efficiency. Individuals have little input into legislative and administrative processes. More influence is likely to be exerted through litigation. Court action often results in the halting of pollution, or potential pollution with relatively little delay. Also, the uncertainty involved in litigation may breed in pollutors insecurities which could lead to rational planning and development. (Sperling-Florida)
W76-01403

CEMENT PRODUCERS CONFRONT ANTI-POLLUTION LEGISLATION,
For primary bibliographic entry see Field 6E.
W76-01404

MARTIN-TRIGONA V. RUCKELSHAUS (CHALLENGE OF EXECUTIVE IMPOUNDMENT OF FWPCA FUNDS).
For primary bibliographic entry see Field 6E.
W76-01405

AMERICAN PLANT FOOD CORP. V. STATE OF TEXAS (APPEAL FROM CRIMINAL CONVICTION FOR POLLUTION OF WATERS).
For primary bibliographic entry see Field 6E.
W76-01407

CONTROL OF THE POLLUTION OF SURFACE WATER BODIES (BESTRIJDING VERONTREININGING OPPERVLAKTEWATER),
For primary bibliographic entry see Field 5D.
W76-01452

BIOLOGICAL CONTROL OF ALLIGATOR WEED,
Office of the Chief of Engineers (Army), Washington, D.C. Aquatic Plant Control Program.
For primary bibliographic entry see Field 4A.
W76-01495

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

WATER RIGHTS AND WATER QUALITY MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5G.
W76-01001

AN OPTIMIZATION MODEL FOR BALANCING ECONOMIC-ENVIRONMENTAL SYSTEMS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5G.
W76-01002

FEDERAL-STATE RELATIONS IN WATER QUALITY PLANNING,
Pennsylvania Dept. of Environmental Resources, Harrisburg.
For primary bibliographic entry see Field 5G.
W76-01003

WATER SUPPLIES FOR LOW-INCOME COMMUNITIES IN DEVELOPING COUNTRIES,
Birmingham Univ. (England) Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-01004

FORMULATION AND USE OF PRACTICAL MODELS FOR RIVER QUALITY ASSESSMENT,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 5G.
W76-01006

COMPUTER ASSISTED PROCEDURES IN WATER PROJECT EVALUATION,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
I. Belyaev, and I. Zimin.
Research Report, RR-75-27, August 1975. 32 p, 8 fig, 11 ref.

Descriptors: *Water resources, *Projects, *Methodology, *Simulation analysis, *Evaluation, *Systems analysis, Computers, Investment, Capital, Economics, Optimization, Water demand, Regions, Planning, Decision making, Networks, River basins, Canals, Constraints, Hydrology, Water management(Applied), Scheduling, Long-range planning, Alternative plannong, Algorithms, Equations, Mathematical models, Damages.
Identifiers: *Water economy, Hydrotechnical structures.

Described is a methodology for solving water economy capital investment problems concerning water economy expansion to meet an increasing demand for municipal, industrial, and other uses within giver resource limitations. Considered is simulation system development, a technique for chossing the rational project variant. A water economy is an individual branch of a region, its connections and interactions with other branches of that region accounted for. The interaction of the regional management (Center) and the branch manager takes place within the framework of a centralized hierarchical system. The Center distributes the resources among managers of separate branches. The information a manager receives may be represented by the vector function of resources C(t) during the planning period. Outout information is a scalar function, which characterizes the loss to the branch if it is not sufficiently supplied with hydrotechnical structures. The first phase of the decision-making process is formulating all feasible alternatves for development of a given regional water management system. The second phase is calculating all versions of the development program for the branch. The third phase is estimating the loss which the branch may incur with a given program of branch development. The latter two phases are provided with appropriate mathematical models and numerical algorithms. (Bell-Cornell)
W76-01007

SOME SYSTEMS CONCEPTS FOR URBAN PLANNING,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Building Research.
J. F. Brotchie.
Royal Australian Planning Institute Journal, Vol 12, No 2, p 43-50, April 1974. 6 fig, 2 tab, 9 ref.

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Descriptors: *Urbanization, *Planning, *Design, *Environmental control, *Economics, Water resources, Costs, Benefits, Pricing, Optimum development plans, Ecology, Recreation, Transportation, Roads, Decision making, Model studies, Systems analysis.
Identifiers: *Urban environment, *Natural environment, Urban development, Environmental quality, Minimal disturbance.

Various concepts concerning the characteristics of an urban system and ways in which they may be utilized in planning are discussed. One concept considers both the disturbance caused to natural systems and the necessary correction of that disturbance. The costs of each are noted to be strongly correlated, leading to the concept that minimal disturbancd requires minimal correction and results in minimal overall cost. Use of the natural environment as a control on urban environment is also discussed. The concept that the whole can be greater than the sum of the parts is used in grouping related components to form a larger subsystem, with greater overall ratio of benefits to costs. A water resources system is considered in particular. The larger sub-system may have a hierarchial structure which may also be used in planning for its improvement. The road system is considered as an example and potential benefits are discussed. Another characteristic is that some sub-systems are complementary whereas others compete, and the economic implications of this are noted. A study of the distribution of total costs of a system may further indicate where beneficial tradeoffs may occur. The use of pricing to implement an optimal plan is considered. Recommendations arising from the above concepts are presented. The above considerations may be introduced as part of a comprehensive approach to urban planning and design. (Bell-Cornell)
W76-01008

ENGINEERING THE BEAR SWAMP PROJECT,
Main (Charles T.) Inc., Boston, Mass.
R. W. Kwiatkowski, and D. R. Campbell.
Journal of the Boston Society of Civil Engineers, Vol 61, No 3, p 132-165, July 1974. 15 fig.

Descriptors: *Pumped storage, *Projects, *Reservoirs, *Hydrologic aspects, Civil engineering, Structures, Rivers, Operations, Simulation analysis, Massachusetts.
Identifiers: *Bear Swamp Project(Mass.), Deerfield River(Mass.).

Considered are some of the principal civil engineering features of the Bear Swamp Pumped Storage Project, located on the Deerfield River in the northwestern corner of Massachusetts, and owned by the New England Power Company. An understanding of the overall project is conveyed in general terms by relating a brief history of the project background together with the most salient of the hydrological aspects, and a broad description of the various project structures. Considered are Deerfield River, plant operation, permits, geology, simulation model studies, the lower and upper reservoirs, reservoir level control, tunnels, the Bear Swamp powerhouse, the Fife Brook powerhouse, diversion, and quaity control. It is concluded that the project has been well designed and constructed and that its operation should be fully satisfactory. (Bell-Cornell)
W76-01010

THE INTEGRATED MULTI-MEDIA POLLUTION MODEL,
Georgetown Univ., Washington, D.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-01013

STRUCTURING COMMUNICATIONS PROGRAMS FOR PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING,
Utah State Univ., Logan, Dept. of Civil and Environmental Engineering.
A. B. Bishop.
Available from the National Technical Information Service, Springfield, Va 22161. IWR Contract Report 75-2, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, May 1975. 125 p, 22 fig, 3 tab, 27 ref.

Descriptors: *Water resources, *Planning, *Management, *Communication, Programs, Decision making, Information exchange, Methodology, Alternative planning, Evaluation, Model studies, River basins, Water quality.
Identifiers: *Public participation, *Interactive planning, Impact assessments.

Federal legislation has demand broad public involvement in water resource planning and management. In response, agencies have promulgated policies and guidelines supporting an open planning process which incorporates a program of citizen involvement throughout. Provided for are public disclosure of information, public hearings, soliciting feedback for management decisions, etc. Although the public's role in water resource planning and management is well established, with planners responding to an enlightened citizenry, many citizens and interest groups are often excluded from meaningful participation. There is a need for continually improving interaction between planner, decision makers, and concerned public interests. Methods and techniques for planner-citizen communication which will enhance the level of public participation in the planning process and permit citizens and planners to work effectively together in arriving at decisions which affect multiple local, state, and federal jurisdictions. Considered are: (1) dynamics of the planning process, including information generation, problem identification, formulation of alternatives, impact assessment, and evaluation; and (2) communication, including communications process models, techniques for public involvement, structuring of communication programs, and an example river basin water quality management and planning problem. Water resources planners need programs through which citizens contribute most constructively to formulating proposed plans, assessing their economic environmental and social impacts, and selecting the best course of action. (Bell-Cornell)
W76-01014

WATER RESOURCES DECISION MAKING ON THE BASIS OF THE PUBLIC INTEREST,
Stanford Univ., Calif. Dept. of Civil Engineering.
L. Ortolano.
Available from the National Technical Information Service, Springfield, Va 22161. IWR Contract Report 75-1, U.S. Army Institute for Water Resources, Fort Belvoir, Virginia, February 1975. 53 p, 4 fig, 1 tab, 37 ref, 2 append. DACW73-73-C-0046.

Descriptors: *Water resources, *Planning, Decision making, Economic efficiency, Cost-benefit ratio, River basins, Alternative planning, Water law, Evaluation, Constraints, Flood control, Systems analysis.
Identifiers: *Public interest, *Public involvement, Pre-authorization studies, Multiple-objective planning, Weights, Factors, Impact analysis, Plan ranking, Field level planning, Alternatives, Environmental quality.

The concept of water resources decision making in the public interest is both fundamental and elusive. Alternative prespectives that have been suggested for defining the public interest are discussed and an overview is presented of the decision making involved in a typical water resources planning study. Various approaches to determining the public interest in pre-authorization planning and decision making are examined. An argument is presented in support of current trends away from reliance on economic efficiency as a basis for defining the public interest and toward the direct involvement of citizens in determining the factors and weights used in defining the public interest. The argument proceeds in three principal parts, each of which constitutes a chapter. After definition of the public interest and the nature of decision making in pre-authorization studies, Chapter Two focuses on the economic efficiency criterion for ranking alternative actions. It elaborates on benefit-cost analysis as an application for the efficiency criterion and on the ways in which the criterion was generally applied in pre-authorization studies during the 1960's. In Chapter Three recent techniques for ranking alternatives on the basis of multiple objectives are discussed in terms of how and by whom the factors and weights are determined. Chapter Four describes a process for integrating public involvement into the determination of factors and weights. Appended for illustration is Manheim's process for highway planning. (Bell-Cornell)
W76-01015

WATER RESOURCE SYSTEMS AND RELATIONS,
Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.
For primary bibliographic entry see Field 2A.
W76-01118

OPTIMIZING INFORMATION TRANSFER IN A STREAM-GAGING NETWORK,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W76-01187

NEEDS AND PLANS IN THE DEVELOPMENT OF URBAN AND RURAL SEWER SYSTEMS (POTRZEBY I PLANY ROZBUDOWY SIECI KANALIZACYJNEI W MIASTACH I OSIEDLACH),
For primary bibliographic entry see Field 8A.
W76-01294

THE WEIBULL PROBABILITY ASSIGNMENT TECHNIQUE: AN APPLICATION TO BENEFIT-COST ANALYSIS,
California Univ., Santa Barbara. Dept. of Economics.
L. J. Mercer, and W. D. Morgan.
Water Resources Research, Vol 11, No 5, p 755-757, October 1975. 2 tab, 4 ref.

Descriptors: *Water importing, *Economic feasibility, *Cost-benefit analysis, *Probability, Projects, Timing, Water supply, Estimating, Statistics, Mathematical models, Systems analysis, California.
Identifiers: *Weibull distribution, *Santa Barbara County(Calif), Uncertainty.

The flexibility of the Weibull distribution and the information gain made possible by its use to deal with the problem of uncertainty in benefit-cost analysis are illustrated by application to a benefit-cost study to determine the minimum feasible timing of water importation, i.e., the earliest point in time when water importation would be economically feasible, for Santa Barbara County. The estimate of minimum feasible timing is developed by constructing a general economic feasibility evaluation model using cost-benefit procedures. Measures of project costs, benefits, and various parameters and conditions, both behavioral and technical, are required to implement this model. The Weibull distribution requires few estimated variables and a minimum of information, is relatively simple to work with mathematically, and can approximate the whole variety of distributions which may characterize input variables in benefit-cost analysis. Use of the Weibull distribution pro-

des the standard deviation and central tendency easures of the output (net benefit, benefit-cost tio, etc.) distribution in benefit-cost analysis as ell as the probability of outcomes indicating a oject is not economically feasible. The applica- on reported shows that the use of the Weibull dis- ibution is superior to the usual point estimates d sensitivity tests in benefit-cost analysis. (Bell- ornell)
76-01331

PPROACHES TO MULTIOBJECTIVE LANNING IN WATER RESOURCE PRO- CTS,
irginia Polytechnic Inst. and State Univ., lacksburg. School of Business Administration.
. W. Taylor, III, K. R. Davis, and R. M. North.
ater Resources Bulletin, Vol 11, No 5, p 999- 08, October 1975. 1 fig, 20 ref.

escriptors: *Water resources, *Project planning, Methodology, *Evaluation, Cost-benefit analy- s, Decision making, Mathematical models, ystems analysis, Environment, Social aspects, conomics, Water pollution, Optimization.
lentifiers: *Multiple-objective planning, Goal rogramming, Surrogate worth trade off method, nvironmental Evaluation System(EES), Personal alue determination, Noncommensurable objec- ves.

ater resource agencies' attempts to include en- ironmental and social (as well as economic) ob- ctives in the evaluation process have not been ery successful. This is due to the fact that enefit-cost analysis, the method commonly em- loyed, is too limited (as currently implemented) accomodate the complexities presented by a ultiple objective approach to water resource evelopment. This article reviews several alterna- ve approaches to water resource evaluation, iscussing the advantages and limitations of each. he alternatives are categorized into two areas: athematical programming and value determina- on methods. In the mathematical programming rea, two techniques are reviewed: goal pro- amming and the surrogate worth trade off ethod. In the value determination area, Environ- ental Evaluation Systems (EES) and personal alue determination are reviewed. While these ethodologies are not all inclusive, they do present an informative cross section of the irection of research in multiple objective decision aking. It is concluded that no one methodology ffers a complete solution to the evaluation roblem; a combination of approaches need be mployed. However, goal programming surfaces s the most workable approach, considering all ob- ctives within a single model framework, with a inimum of complexity. (Bell-Cornell)
76-01335

ODELING OF FUTURE EXPENDITURES FOR LANNING AND ECONOMIC EVALUATION F ALTERNATIVES,
. Koenig.
ater Resources Bulletin, Vol 11, No 5, p 933- 45, October 1975. 1 fig, 8 equ, 1 tab, 1 append.

escriptors: *Water resources, *Projects, Alternative planning, *Economics, *Evaluation, Expenditures, Engineering, Long-term planning, perating costs, Decision making, Mathematical odels, Human population, Interceptor sewers, quations, Design, Systems analysis.
lentifiers: Prediction, Cost escalation, Linear, ogarithmic.

n analysis is made of current engineering prac- ces in modeling future cash expenditures and ducing a series of them to present value so that conomic comparisons may be made among alter- ative schemes. Considered is project planning for n interceptor sewer system for an area in which e pattern of population density was predicted to hange over future years of population growth. The principles developed are applicable to any kind of engineering system or facility requiring economic decisions among alternatives with differing useful lives or differing profiles of cash expenditures over many years. Discussed herein are the reality and predictability of cost escalation, a beginning-of-period model versus an end-of-period model, the discount rate versus real interest rates, linear and logarithmic cost escalation, the present value of uniform periodic constant-dollar expenditures, cash flow in the post-project period, design into the post-project period, and continuance of performance in the post-project period. Current practices are criticized and recommendations for improvements over conventional methods in the engineering economic analysis of alternatives with different multi-year profiles of expenditures are given. (Bell-Cornell)
W76-01336

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES,
Iowa Univ., Iowa City, Inst. of Hydraulic Research.
T. E. Croley, II.
No 69, Hydrology Papers, Colorado State University, Fort Collins, Colorado, September 1974. 31 p, 12 fig, 16 tab, 77 equ, 48 ref, 5 append.

Descriptors: *Water resources, *Optimization, *Reservoir operation, *Stochastic processes, Planning, Dynamic programming, Simulation analysis, Statistical methods, Costs, Equations, Mathematical models, Systems analysis.
Identifiers: *Deterministic optimization techniques, *Stochastic optimization techniques, *Computation reduction, Data generation.

Reduction of computation effort in water resources optimization problems can be made through a modification of the optimization technique instead of through limiting development of the system models. Considerations are presented herein which lead to the development of a heuristic application of deterministic optimization techniques. The modification enables reduction of computation to take place while achieveing results that approximate the optimum. The modified application of dynamic programming is made for a single reservoir system problem to illustrate the technique and the achievement of near optimum performance. Stochastic optimization techniques that are used in water resource systems engineering are presented. A heuristic alternate stochastic optimization technique is then described and suggested as an improvement. Feasible use of this alternate is possible since observations on planning horizons are employed in computation reduction. For a single reservoir system, the techniques are applied and compared. Computation costs are reduced and system performance is improved with the use of the alternate. Several studies are outlined which illustrate changes in the technique results with changes in the problem formulation. The techniques work well for all problem variations considered here; indicated is that the techniques perform best for realistic problem formulations. (Bell-Cornell)
W76-01338

DETERMINATION OF URBAN WATERSHED RESPONSE TIME,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W76-01339

STOCHASTIC ANALYSIS AND CONTROL OF URBAN ESTUARINE WATER-QUALITY SYSTEMS: VOL I--ESTIMATION AND PREDICTION,
New York City, Rand Inst. N.Y.
For primary bibliographic entry see Field 5G.
W76-01340

THE ECONOMIC EFFICIENCY OF INTERBASIN AGRICULTURAL WATER TRANSFER IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W76-01341

A SYSTEMS ANALYSIS OF A CONTINUOUS WATER QUALITY MONITORING PROJECT,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W76-01342

6B. Evaluation Process

DESIGN GRAPHS FOR ACTIVATED SLUDGE PROCESS,
CH2M-Hill, Reston, Va.; and Hill (Clair A.) and Associates, Reston, Va.
For primary bibliographic entry see Field 5D.
W76-01005

COMPUTER ASSISTED PROCEDURES IN WATER PROJECT EVALUATION,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W76-01007

SOME SYSTEMS CONCEPTS FOR URBAN PLANNING,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Building Research.
For primary bibliographic entry see Field 6A.
W76-01008

QUANTITATIVE TECHNIQUES FOR EVALUATING THE ENVIRONMENTAL IMPACT OF TRANSPORTATION SYSTEMS,
Sydney Area Transportation Study (Australia).
For primary bibliographic entry see Field 4C.
W76-01009

WATER RESOURCES DECISION MAKING ON THE BASIS OF THE PUBLIC INTEREST,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-01015

COGNITIVE STRAWMAN: PUBLIC INPUT TO A WATER RESOURCE PLANNING SYSTEM,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
R. M. Judge.
Ph D Dissertation, 1975. 100 p, 9 fig, 14 tab, 53 ref.

Descriptors: *Water policy, *Water resources development, *Comprehensive planning, *Planning, *Social aspects, Potential water supply, Conservation, Methodology, Water supply development, Project planning, Arizona, Water resources, Water utilization.
Identifiers: Rio Grande Valley(New Mexico).

An information system was developed to facilitate input of public values and goals into planning and evaluation processes. The technique was then applied to subjects in Arizona and the Rio Grande Valley of New Mexico in a water resources planning study. Research indicated that community values can be input to the planning process by the use of disaggregated goal structure and the quantifying function. The general allocation technique, used in mail survey, shows promise as a means of discovering community preference and providing the necessary link between professional

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and public goals for a water system. (McLachlan-Arizona)
W76-01110

ON THE MARICULTURE OF THE FLORIDA SEAWEED, EUCHEUMA ISIFORME,
University of South Florida, Tampa. Dept. of Biology.
C. J. Dawes.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM 7411698, $3.50 in paper copy, $2.25 in microfiche. Florida Sea Grant Program Report No 5, August 1974. 12 p, 1 fig, 15 ref.

Descriptors: *Aquiculture, *Marine algae, *Rhodophyta, Florida, Growth rates, Planting management, Feasibility studies, Economic feasibility, Operating costs, Carbohydrates, Ecological distribution.
Identifiers: Mariculture, Eucheuma isiforme, Carrageenan, Seaweeds.

Because seaweeds containing the phycocolloid carrageenan do not meet the demand, mariculture of Eucheuma isiforme in Florida is of interest. E. isiforme is common in the Florida Keys, is a perenninal, has the highest yield of carrageenan, and grows rapidly. To determine if Eucheuma can be grown in Florida under controlled conditions to obtain an economically feasible product, mariculture procedures in either natural embayments or in culture tanks are discussed. Mariculture of Eucheuma in natural embayments would be restricted to only 2-3 harvests per year, herbivores and storms could decrease yields, and mixtures with other seaweeds would reduce the value of the harvest; however operating costs would be low. Culture tanks would eliminate or lessen these problems and permit year-around harvesting. A much higher crop per unit area than field culture ($9.72/sq m/yr compared to $0.16/sq m/yr) would result, but expenses for tank construction, water circulation, and temperature control would be greater. From the present understanding of the ecology and biochemistry of E. isiforme, mariculture seems feasible, pending pilot plant studies. (Buchanan-Davidson--Wisconsin)
W76-01151

WATER RESOURCES PLANNING,
O. Gibb.
Journal of the Institute of Water Pollution Control, Vol 74, No 3, p 262-276, 1975. 4 fig, 1 tab, 8 ref.

Descriptors: *Water resources development, *Comprehensive planning, *Long-term planning, *Water supply, *Water quality control, Conservation, Coordination, Demand, Effluents, Disposal, Pollution abatement, Water quantity, Water balance, Standards, Fisheries, Recreation, Land drainage, Navigation.
Identifiers: *Multiple objectives.

A survey of comprehensive, long-term planning and the optimum use of water resources in Great Britain is presented. Needed are strategies to coordinate and fulfill multiple objectives at minimum cost, with water supply and conservation and effluent disposal and pollution control as primary considerations. Other objectives include preservation of fisheries, recreation and amenity, land drainage and flood protection, and navigation. The Water Act of 1973 provides the opportunity for multi-purpose water resources development in England and Wales. The creation of powerful water authorities responsible for all aspects of the water cycle in their designated river basin should ensure the optimum development within the limits of available finance. Survey results suggest that the reconciliation of objectives in the water supply and quality control fields, within financial constraints, may necessitate challenging traditional concepts of reliability of public supplies. While individual authorities will have their own priorities in allocation of available financial resources, it seems essential that any move towards a change in traditional standards should receive general acceptance throughout the whole industry. Furthermore, it would seem desirable that the implications of such changes should be spelt out clearly both for water supplies and the residual flows in rivers. (Bell-Cornell)
W76-01328

WATER REUSE: A FLEXIBLE AND EFFICIENT MANAGEMENT ALTERNATIVE FOR MUNICIPAL WATER SUPPLY,
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 5D.
W76-01330

THE WEIBULL PROBABILITY ASSIGNMENT TECHNIQUE: AN APPLICATION TO BENEFIT-COST ANALYSIS,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W76-01331

CITIZEN INFLUENCE IN WATER POLICY DECISIONS: CONTEXT, CONSTRAINTS, AND ALTERNATIVES,
Washington State Univ., Pullman. Dept. of Political Science.
H. R. Doerksen, and J. C. Pierce.
Water Resources Bulletin, Vol 11, No 5, p 953-964, October 1975. 31 ref.

Descriptors: *Water policy, *Water resources, *Planning, Alternative planning, *Political aspects, Constraints, *Decision making, Social participation.
Identifiers: *Public participation, Conflicts, Models, Linkage.

The desirable proportion of citizen input into policy making and the proper mechanism for that input engender substantial conflict in the water resources arena. Nevertheless, discussions of citizen participation in water policy formation generally occur within narrow perspectives both with regard to the issues involved and the alternative mechanisms by which that participation can be realized. This paper examines the historical and current contexts of the controversies and presents a discussion of the alternative processes for citizen influence, called linkage. The linkage processes discussed include direct participation, citizen advisory committees, the pressure group model, the electoral model, and the bureaucratic model.Each linkage process is discussed in terms of who is considered the public, how the public influence works, the limitations of the process, and what available water policy-related data suggest regarding the adequacy of the process. (Bell-Cornell)
W76-01332

ENVIRONMENTAL IMPACT STATEMENTS IN PLANNING WATER AND RELATED LAND RESOURCES,
State Univ. of New York at Syracuse. Coll. of Environmental Sciences and Forestry.
For primary bibliographic entry see Field 6G.
W76-01333

APPROACHES TO MULTIOBJECTIVE PLANNING IN WATER RESOURCE PROJECTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. School of Business Administration.
For primary bibliographic entry see Field 6A.
W76-01335

MODELING OF FUTURE EXPENDITURES FOR PLANNING AND ECONOMIC EVALUATION OF ALTERNATIVES,
For primary bibliographic entry see Field 6A.
W76-01336

WATER QUALITY AND RESOURCES PLANNING MUST BE UNITED,
Gilbert J.B. and Associates, Berkeley, Calif
For primary bibliographic entry see Field 5G.
W76-01343

NONSTRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT, WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY,
Cheney, Miller, Ellis and Associates, Inc., Putnam, Conn.
For primary bibliographic entry see Field 6F.
W76-01345

PRIORITIES IN WATER MANAGEMENT.
Victoria Univ. (British Columbia). Dept. of Geography.
Western Geographical Series, Vol 8, F.M. Leversedge, ed. University of Victoria, Victoria, British Columbia, 1974. 300 p, 15 fig, 19 plates, 27 tab.

Descriptors: *Water management(Applied), *Nonstructural alternatives, *Water supply development, Instrumentation, *Planning, *Water policy, Environmental engineering, *Water quality control, Water resources, *Pricing, Alternative water use, Potential water supply, Water conservation, Water pollution control, Cost-benefit analysis, Great Lakes, Management.
Identifiers: Tijuana River(U.S. Mex), Citizen participation.

The 13 papers in this volume develop the theme 'Water Resources Management: Traditions and Tasks' into 6 subject areas: Engineering Environmental Hazards; Hind-sight Evaluation; Water Quality Management; Water Pricing Policies; Institutions and the Public; and Planning and Policy-Making. Citing national and international case studies, a variety of water management issues, particularly evaluation and policy formulation, are explored. Planned versus realized cost-benefits of multipurpose projects becomes the focus of dealing with hindsight analysis. The papers discuss policy design and strategies of water quality management. Eutrophication control of the lower Great Lakes provides an example of the application of planning and decision-making possibilities of an international water body. 'Water Pricing Policies' explores the feasibility of replacing supply management with demand management through the use of pricing policies such as seasonal pricing, peak load pricing and domestic water metering as alternatives to technological solutions. Guidelines for citizen participation in the decision-making process are developed from case studies which outline and evaluate established water management programs in the Great Lakes, Tijuana River and three U.S. rivers. In the last section, W.R. Sewell identifies basic water management problems, and then outlines strategies for planning, policy formulating and decision making. (See W76-01348 thru W76-01360) (Salzman-North Carolina)
W76-01347

ENVIRONMENTAL HAZARDS OF LARGE SCALE WATER DEVELOPMENTS,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6G.
W76-01348

BENEFIT-COST ANALYSIS AND MULTIPLE-PURPOSE RESERVOIRS: A REASSESSMENT

F THE CONSERVATION AUTHORITIES' RANCH DEER CREEK PROJECT, ONTARIO,
niversity of Western Ontario, London.
D. Day.
: Priorities in Water Management, Western Geo-aphical Series, Vol 8, F. M. Leversedge, ed. niversity of Victoria, Victoria, British Columbia, 23-35, 2 fig, 1 tab, 6 ref, 1974.

escriptors: *Cost-benefit analysis, *Economics, Feasibility studies, *Project planning, Reservoirs, *Project benefits, Construction sts, Real benefits, Estimated benefits, Intangi-e benefits, Decision-making, Water policy, anada.
entifiers: *Branch Deer Creek, Ontario.

mparison of benefits and costs anticipated dur-g the project planning in 1967, and a reassess-nt in 1971 of the Deer Creek reservoir and road, derlines the disparity between estimated costs d incurred costs as well as inaccurate assump-ns made by the analysts. Deer Creek watershed s forest and agricultural land of excessive soil isture and low fertility. Anticipated primary nefits were a new road and increased farm oductivity due to improved irrigation water ailability. Intangible benefits would be increased mestic water supply, groundwater tables, reation, firefighting, regional economic growth, d flood control opportunities. Originally esti-ated to cost $579,000, the completed project sts had increased 15% to $686,000. Erroneous lculations developed from not accounting for all tial costs (original feasibility study, $8000; rise land acquisition from $5,000 to $40,000; and rise engineering fees from $47,370 to $84,000); as-ming farmers' willingness to increase produc-ity and change crop selection patterns when sur-ys indicated otherwise; disregarding fact of ex-ing ample water supply for domestic water uses, efighting and livestock watering. The claim that e project would promote regional economic owth seems improbable. Although recreational portunities did increase, final assessment in-ates that only 44% of project costs were tified. Need for 56% of project expenses at-buted to building of the road was not explained. sed on primary conservation benefits, the nefit-cost ratio of the Deer Creek project was after 2 years of operation since farmers did not nt sufficient tobacco to claim minimum irriga-n benefits. Assessing project feasibility is ectly affected by inadequate review procedures d ineffective interagency coordination among vernmental agencies. (See also W76-01347) lzman-North Carolina)
76-01349

LUE CONFLICTS AND WATER SUPPLY CISIONS,
terloo Univ. (Ontario).
Mitchell.
Priorities in Water Management, Western Geo-phical Series, Vol 8, F. M. Leversedge, ed. iversity of Victoria, Victoria, British Columbia, 7-59, 1 fig, 35 ref. 1974.

scriptors: *Reservoirs, Water resource velopment, *Decision making, *Governments, oordination, Psychological aspects, Social ects, *Water supply development, Planning, st-benefit analysis, Social participation.
ntifiers: Liverpool(UK) Tryweryn of Llyn lyn Reservoir(UK), Wales(UK), Value con-ts, *United Kingdom.

bate over construction of the Tryweryn of Llyn yn reservoir in Wales by the City of Liverpool phasize the conflict situation concerning ource development. The controversy is iewed to determine what lessons emerge from a ource development project in which values ed on different uses of water resources were direct conflict. Tryweryn was perceived as a g term, large scale project which through scale nomy savings would best satisfy increasing water demands of Liverpool. Opposition to the reservoir focused on the validity of the initial benefit-cost analysis, over-estimation of industrial needs and residential growth, and the exploition of Welsh resources. Environmental and social costs, including damage to an already declining agricultural area, were not considered. A more equitable, comprehensive management strategy requires more than one perspective to be considered. This controversy demonstrates the inability of current methods to identify, define, measure and compare different social concerns (ecological, economic and social values). A water management system must reflect effective water uses and show an interrelationship with other plans and values of society. Adequate criterion must be developed to evaluate benefits and cost, optimum size, and priorities of values with respect to those values. This hindsight evaluation suggests that the instrument for resolution of the conflict of values will be the political process. (See also W76-01347) (Salzman-North Carolina)
W76-01350

RESEARCH ISSUES IN WATER QUALITY MANAGEMENT,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5G.
W76-01351

DECISION TO CONTROL EUTROPHICATION,
Canada Centre for Inland Waters. Burlington (Ontario).
For primary bibliographic entry see Field 5G.
W76-01352

USER RESPONSE TO WATER QUALITY AND WATER-BASED RECREATION IN THE QU'APPELLE VALLEY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5G.
W76-01353

NEW STRATEGIES FOR WATER RESOURCE PLANNING AND MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 4A.
W76-01354

THE POTENTIAL IMPACT OF PEAK LOAD PRICING ON URBAN WATER DEMANDS: VICTORIA, BRITISH COLUMBIA, A CASE STUDY,
Victoria Univ. (British Columbia).
For primary bibliographic entry see Field 6D.
W76-01355

WATER MANAGEMENT AND PRICING POLICIES IN ENGLAND AND WALES,
London School of Economics and Political Science (England).
J. A. Rees.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 163-194, 4 fig, 3 tab, 37 ref. 1974.

Descriptors: *Pricing, *Water supply, *Legislation, *Marginal costs, Water distribution(Applied), River basin development, Water rates, Reservoirs.
Identifiers: *United Kingdom, Malvern(UK), Metering of water use, Regional Water Authority, 1945 Water Act(UK), 1963 Water Resources Act(UK).

In the United Kingdom, lack of control over independent abstractions of water resulted in aquifer exhaustion and overpollution and inefficient development of new storage capacity. Three responses have occurred: (1) larger engineering schemes, with storage capacity, transport and cleaning facilities being developed to meet all foreseeable peak requirements in all areas; (2) changes in management structure of the water industry with reduction of the number of supply undertakings and introduction of a system of coordinated water management at the river basin level; and (3) steady removal of common law water rights to use stream courses and aquifers. Right to dispose of effluent has been curtailed and rights to obstruct water have been limited. Improved pricing techniques are provided in the 1974 Water Bill which transfers responsibility for revenue raising from local water and sewerage authorities to ten Regional Water Authorities. All water uses are to financed directly from charges made for services given and permits metering of all types of water use and charging on a quantity- taken basis. This could allow for metering domestic consumers and establishment of effluent charges, two measures hitherto strongly resisted. Under optimal pricing arrangements, the consumer pays the long run marginal costs which allows water to be allocated efficiently between competing uses. Using data obtained from Malvern, England, which has successfully enforced water metering to control demand, a forecast is made that metering can cause a decrease of over 20% in water demand. The merits of introducing metering in England and Wales are discussed with special attention given to cost of metering new property. Disposal of effluent is now subject to control on the quality, quantity, and timing of discharge. (See also W76-01347) (Salzman-North Carolina)
W76-01356

THE ROLE OF THE PUBLIC IN DECISION-MAKING,
Wisconsin Univ., Madison.
E. L. David.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 203-215, 14 ref. 1974.

Descriptors: *Decision making, *Attitudes, *Planning, *Coordination, *Institutions, Social aspects, Non-structural alternatives, Surveys.
Identifiers: *Susquehanna River Basin, *Brandywine River Basin, *Wisconsin River Basin, *Public participation, Gaming simulation.

If those who are affected by decisions are not involved in the decision-making process, inefficient and inequitable decisions will result. Problems of perceptions and interaction, composition of the relevant i and relationships between the public and institutions involved in water management are discussed. Although there are constraints on the use of survey research as a tool for public participation it can be used to inform decision-makers of public opinions and attitudes, to determine amount of information the public has on a particular topic, and to isolate opinions, goals and perceptions of sub-groups. Public hearings, a very limited tool, generally Poorly and selectively attended, tend toward an adverse mechanism between an under- informed, ill-organized public and a well-organized bureaucracy. Gaming simulation can expose the need for cooperation. There seems to be a broad potential for the gaming simulation technique which is only beginning to be explored. The challenge is to design institutions which will coalesce interested subgroups and bring their interest to bear throughout the decision-making process while insuring that the broadest feasible range of well-informed interests is represented. (See also W76-01347) (Hufschmidt-North Carolina)
W76-01357

MANAGEMENT OF THE INTERNATIONAL GREAT LAKES,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 6E.
W76-01358

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THE ROLE OF THE ACADEMIC IN WATER RESOURCES POLICY-MAKING: THE TIJUANA RIVER, A CASE STUDY,
California State Univ., San Diego.
E. Keen.
In: Priorities in Water Management, Western Geographic Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 241-255, 9 ref. 1974.

Descriptors: *Water supply development, *Cost-benefit analysis, *Social aspects, *Planning, *Political aspects, *Environmental effects, *Flood control, Water resources development, Ecology, Mexico, United States, Decision-making, Flood plains, Data.
Identifiers: *Tijuana River(Calif-Mexico), Tijuana River Flood Control Project, Academic community, Public participation.

Proposed for the Tijuana River Basin, an area of sparse vegetation situated in both Mexico and the United States, the Tijuana River Flood Control Project would control a high, but infrequent, runoff (3800 cubic meters/sec runoff occurring once in over 300 years) presently controlled by 3 large storage dams which would not contain a 100-year flood. Initially endorsed by the Army Corps of Engineers the project was suspended by Congressional inaction and probably will be killed by local governments after increasing public opposition underlined the increasing environmental and social costs, as well as capital costs to be incurred by the communities, that were not considered in the Corps benefit-cost analysis. The author, a geographer who organized the opposition forces and distributed information extensively researched, discovered manipulation of data by the Corps to alter the benefit-cost analysis and concluded that the project completion decision was political, not economic. Results of a study by local citizens, including faculty, indicated the project was wasteful of environmental as well as fiscal resources; damage to a salt marsh and farmland coupled with the high costs provided the arguments against the project. Subsequently, the public selected ecologically concerned government leaders in the next election who stopped the project. Realizing the leadership and testimony provided by academic personnel added to the effectiveness of the opposition, it is suggested that faculty members be obliged to contribute 20% of the academic responsibilities to service to the community as researchers, political decision-makers, interest group leaders and teachers of community participation. (See also W76-01347) (Salzman-North Carolina)
W76-01359

WATER RESOURCES PLANNING AND POLICY-MAKING: CHALLENGES AND RESPONSES,
Univ. Victoria. (British Columbia).
W. R. D. Sewell.
In: Priorities in Water Management, Western Geographic Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 259-286, 2 fig, 57 ref. 1974.

Descriptors: *Planning, *Potential water supply, *Research and development, *Water allocation(Policy), *Water policy, *Attitudes, *Decision making, Institutions, Non-structural alternatives, Social values, Social participation.
Identifiers: Public participation.

Contemporary water resources management faces 3 challenges: problem complexity and severity, competition for investment, and shifts in social values. These challenges imply a need for a broadened perspective in water management which accounts for economic, social, and ecological consequences and which examines alternative ways of dealing with a problem. Water shortages coupled with decline in quality has caused over-extraction of 'pure' sources and increasing demand between competitive users. As supplies decrease, increased investment in water projects is expected to provide greater economic and social benefits. Skepticism concerning the adverse impacts of major water development projects as well as demand to participate in the decision-making process reflects the public's change in attitudes. Conventional means (the public hearing, the ballot box or referenda) of assessing public views do not seem to indicate public wants or reactions to proposed plans. The planning and policy-making model outlined described its processes as a series of sequential steps, identifying the goals or policy, specifying the problem, listing potential strategies, evaluating these, selecting a strategy and then implementing it. The processes include feedback loops to allow hindsight review of performances. To eradicate the weaknesses in water resource management such as identification of goals, range of alternatives and policy review requires increased public involvement in the planning process as well as adoption of economic principles. Research is needed to develop techniques to evaluate a wide range of strategies and improve mechanisms to increase citizen participation. (See also W76-01347) (Salzman-North Carolina)
W76-01360

URBAN WATER DEMAND: AN ECONOMIC EVALUATION,
Sydney Univ., (Australia). School of Economics.
For primary bibliographic entry see Field 6D.
W76-01423

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

TECHNICAL AND ECONOMIC OPTIMIZATION OF REGIONAL WASTEWATER MANAGEMENT (TECHNISCHE UND WIRTSCHAFTLICHE OPERIMIERUNG BEI DER BILDUNG VON ZWECKVERBAENDEN ZUR ABWASSERBESEITIGUNG),
For primary bibliographic entry see Field 5G.
W76-01277

BENEFIT-COST ANALYSIS AND MULTIPLE-PURPOSE RESERVOIRS: A REASSESSMENT OF THE CONSERVATION AUTHORITIES' BRANCH DEER CREEK PROJECT, ONTARIO,
University of Western Ontario, London.
For primary bibliographic entry see Field 6B.
W76-01349

NEW STRATEGIES FOR WATER RESOURCE PLANNING AND MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 4A.
W76-01354

THE HIGH COST OF RUNOFF CONTROLS: IS HELP NEEDED.
For primary bibliographic entry see Field 5D.
W76-01378

PRICE-INVESTMENT POLICIES OF URBAN WATER AUTHORITIES,
New South Wales Univ., Kensington (Australia). School of Economics.
D. R. Gallagher.
In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 136-139, May 1975. 21 ref.

Descriptors: *Water rates, *Pricing, *Water allocation(Policy), *Water demand, Water supply, Cities, Investment, Economic efficiency, Water costs.

Price policy secures a link between investment in water supply facilities and the allocation and use of water supplied. The existing water rates policy tends to encourage water use and needlessly large water supply systems. An alternative price policy is discussed. The peak load price policy allows a more effective control of water demand and supply expansion. Demand control technology is needed in the urban water supply industry. (CSIRO)
W76-01422

STUDY OF THE RELATIONSHIP BETWEEN EFFICACY OF PURIFICATION AND CONSTRUCTION AND OPERATING COSTS OF PURIFICATION PLANTS (UNTERSUCHUNG UEBER DIE BEZIEHUNG ZWISCHEN REINIGUNGSGRAD UND BAU UND BETRIEBSKOSTEN VON KLERANLAGEN),
For primary bibliographic entry see Field 5D.
W76-01448

6D. Water Demand

WATER RESOURCES ASPECTS OF THE PROPOSED PERKINS STATION NUCLEAR POWER PLANT.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Water Resources Planning Dept.
For primary bibliographic entry see Field 8A.
W76-01274

FACTORS AFFECTING ADOPTION OF LAND TREATMENT OF MUNICIPAL WASTE WATER,
North Carolina State Univ. at Raleigh. Dept. of Economics and Business.
For primary bibliographic entry see Field 5D.
W76-01329

THE POTENTIAL IMPACT OF PEAK LOAD PRICING ON URBAN WATER DEMANDS: VICTORIA, BRITISH COLUMBIA, A CASE STUDY,
Victoria Univ. (British Columbia).
W. R. D. Sewell, and L. Roueche.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 141-161, 2 fig, 7 tab, 14 ref. 1974.

Descriptors: *Water demand, *Water management(Applied), *Pricing, *Elasticity of demand, Non-structural alternatives, Cost allocation, Marginal costs, Water supply, Canada.
Identifiers: *Peak load pricing, *Victoria(British Columbia), *Seasonal pricing, David Hanke model, Sewell-Roueche model, Price elasticities.

The emerging crisis in urban water management stems from the problem of satisfying demands. A critique on urban water pricing policies suggests that present prices based on average costs cause water outputs which exceed supply capacity and result in waste. Ideally, pricing policies should be based on marginal costs, and the price of water supplied in peak periods should carry the full cost of supplying it. Tod determine prices, the elasticity of demand must be estimated. After citing several studies undertaken to estimate demand of water, this paper tests their conclusions against a case study in Victoria, British Columbia, in hopes of refining the theory relating to demand analysis. The Victoria water supply system was assessed on variables of consumption, price income, average summer temperatures and average summer rainfall. These data served as aids in computing a demand function which indicated that temperature and rainfall were significant variables and that price had no effect on summer demand. Study results show that demand is moderately inelastic although, surprisingly, peak period elasticities are lower than off-peak elasticities. Seasonal pricing would stimulate reduction in peak demands and encourage increase in off-peak demands resulting in a more continuous use of a larger proportion of

t| facilities. (See also W76-01347) (Salzman-
rth Carolina)
V6-01355

ATER MANAGEMENT AND PRICING POLI-
ES IN ENGLAND AND WALES,
ndon School of Economics and Political
ence (England).
r primary bibliographic entry see Field 6B.
V6-01356

ICE-INVESTMENT POLICIES OF URBAN
ATER AUTHORITIES,
w South Wales Univ., Kensington (Australia).
hool of Economics.
r primary bibliographic entry see Field 6C.
V6-01422

URBAN WATER DEMAND: AN ECONOMIC
ALUATION,
dney Univ., (Australia). School of Economics.
W. Robinson.
Hydrology Symposium, Armidale Australia
5. The Institution of Engineers Australia,
prints of Papers, p 140-143, May 1975. 1 fig, 17
r

scriptors: *Water demand, *Economic predic-
hs, *Water rates, *Elasticity of demand,
ustralia, Water users, Water utilization,
recasting, Projections, Pricing, Urban areas.

recasting long run water requirements generally
umes that consumer tastes, technology, price
commodity, prices of other goods and income
stable over time. Evidence is presented, in the
rse of a critique of the Australian water rate
tem, which demonstrates the positive value and
amic nature of the determinants of water de-
nd. Results of a residential water demand pilot
vey are presented and discussed. (CSIRO)
V6-01423

TRADEOFFS BETWEEN IRRIGATION
STEMS WITH DIFFERENT RELIABILITIES
SUPPLY,
w South Wales Univ., Kensington (Australia).
hool of Economics.
primary bibliographic entry see Field 3F.
V6-01424

6. Water Law and Institutions

WATER RIGHTS AND WATER QUALITY
NAGEMENT,
rginia Polytechnic Inst. and State Univ.,
cksburg. Water Resources Research Center.
primary bibliographic entry see Field 5G.
W6-01001

DERAL-STATE RELATIONS IN WATER
ALITY PLANNING,
nsylvania Dept. of Environmental Resources,
risburg.
primary bibliographic entry see Field 5G.
6-01003

E ROLE OF THE WISCONSIN DEPART-
NT OF AGRICULTURE IN AGRICUL-
AL POLLUTION PREVENTION AND CON-
OL,
sconsin Dept. of Agricultural, Madison.
primary bibliographic entry see Field 5E.
6-01018

M POLLUTION: HOW REGULATIONS AF-
T YOU.
essful Farming, Vol 72, No 8, p 30, June-July,

Descriptors: *Permits, *Regulation, *Livestock, *Farm wastes, Waste storage, Waste disposal, Cost sharing, Legal aspects, Feed lots, Cost sharing.
Identifiers: *Laws, Farm pollution, Stock yards.

Several states now administer Federal discharge permits. Only one permit is needed which covers both state and Federal regulations. But in most states, you need two permits--both state and Federal. All livestock facilities, which have a waste discharge and which hold for 30 days the following number of animals, must apply for a permit: slaughter and Feeder cattle-1,000; mature dairy cattle-700; all swine over 55 lbs-2,500. Livestock confinement facilities include open feedlots, confined feeding operations, stockyards, livestock auction barns and buying stations. Non-point source regulations are gaining consideration. Information and instructions on how to apply for permits and where to get cost-sharing help is given. (Cameron-East Central Oklahoma State)
W76-01022

FEEDLOT POLLUTION,
Montana State Dept. of Health, Helena. Water Pollution Control Section.
For primary bibliographic entry see Field 5E.
W76-01027

LIQUID MANURE MANAGEMENT FOR SWINE,
Texas Agricultural Extension Service, College Station.
For primary bibliographic entry see Field 5E.
W76-01030

IMPACT OF NITRATE FERTILIZER RESTRICTIONS ON SALT RIVER PROJECT AND ROOSEVELT WATER CONSERVATION DISTRICT GROWERS,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5C.
W76-01114

SALINITY POLICY FOR COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-01126

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BAUXITE REFINING SUBCATEGARY OF THE ALUMINUM SEGMENT OF THE NON-FERROUS METALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01201

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TIRE AND SYNTHETIC SEGMENT OF THE RUBBER PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01202

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SOAP AND DETERGENT MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01203

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR NEW SOURCES. BEET SUGAR PROCESSING SUBCATEGORY OF THE SUGAR PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01204

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE MAJOR INORGANIC PRODUCTS SEGMENT OF THE INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W76-01205

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE RED MEAT PROCESSING SEGMENTS OF THE MEAT PRODUCTS AND RENDERING PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W76-01206

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE MILLS POINT SOURCE CATEGORY,
Enivronmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.
W76-01207

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS - FEEDLOTS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01208

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SYNTHETIC RESINS SEGMENT OF THE PLASTICS AND SYNTHETIC MATERIALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01209

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SMELTING AND SLAG PROCESSING SEGMENTS OF THE FERROALLOY MANUFACTURING POINT SOURCE CATEGORY,.
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01210

LIBRARY U. OF I. URBANA-CHAMPAIGN

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE DAIRY PRODUCT PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01211

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE UNBLEACHED KRAFT AND SEMICHEMICAL PULP SEGMENT OF THE PULP, PAPER, AND PAPERBOARD MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01212

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BASIC FERTILIZERS CHEMICALS SEGMENT OF THE FERTILIZER MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01213

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE STEEL MAKING SEGMENT OF THE IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guelines Div.
For primary bibliographic entry see Field 5G.
W76-01214

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE INSULATION FIBERGLASS MANUFACTURING SEGMENT OF THE GLASS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01215

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE APPLE, CITRUS, AND POTATO PROCESSING SEGMENT OF THE CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01216

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BUILDING, CONSTRUCTION, AND PAPER SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environemental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01217

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SECONDARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01231

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR THE CATFISH, CRAB, SHRIMP AND TUNA SEGMENTS OF THE CANNED AND PRESERVED SEAFOOD PROCESSING INDUSTRY POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div
For primary bibliographic entry see Field 5G.
W76-01237

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PETROLEUM REFINING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guideines Div.
For primary bibliographic entry see Field 5G.
W76-01238

CITIZEN INFLUENCE IN WATER POLICY DECISIONS: CONTEXT, CONSTRAINTS, AND ALTERNATIVES,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W76-01332

PRIORITIES IN WATER MANAGEMENT.
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W76-01347

VALUE CONFLICTS AND WATER SUPPLY DECISIONS,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 6B.
W76-01350

RESEARCH ISSUES IN WATER QUALITY MANAGEMENT,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5G.
W76-01351

USER RESPONSE TO WATER QUALITY AND WATER-BASED RECREATION IN THE QU'APPELLE VALLEY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5G.
W76-01353

MANAGEMENT OF THE INTERNATIONAL GREAT LAKES,
Cornell Univ., Ithaca, N.Y.
L. B. Dworsky.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 217-239, 9 ref. 1974.

Descriptors: *International Joint Commission, *Management, *Planning, *Comprehensive planning, *Regional development, Non-structural alternatives, Administration, Institutions, Water management(Applied), Government, *Great Lakes.
Identifiers: Boundary Water Treaty.

Following the Boundary Water Treaty (1909), the International Joint Commission (IJC) was formed by Canada and the United States to manage the rivers and lakes sharing the common boundary by constructing dams and hydroelectric power facilities, controlling water pollution and floods, exchanging lands affected by changed water courses and undertaking other tasks assigned by either country. The institutional structural inadequacies of the IJC in meeting these obligations became the focus of a Canada-U.S. University Seminar attempting to develop an alternative management plan which could effectively meet current problems such as deterioration of water quality, diffused public interest, apathy, skewed national priorities, inadequate legislation, special interest politics, fragmentation of responsibilities and organizational jealousies. To resolve these conflicts, the seminar, comprised of academies, students and government officials, proposed two alternatives: (1) organizational improvements to remove constraint of allowing IJC to act only on referred matter and permit a more active role in public decision-making process, and (2) establishment of a joint management agency with a joint budget and administrative procedures, initiatory authority for planning, surveys, and research to develop a comprehensive and integrated approach to management using joint information collection and analysis, and public reporting. The study process provided large opportunities for small group dialogue which emphasized independence, credibility, fairness and objectivity. (See also W76-01347) (Salzman-North Carolina)
W76-01358

THE ROLE OF THE ACADEMIC IN WATER RESOURCES POLICY-MAKING: THE TIJUANA RIVER, A CASE STUDY,
California State Univ., San Diego.
For primary bibliographic entry see Field 6B.
W76-01359

WATER POLLUTION LAWS AND REGULATIONS,
Missouri Univ., Columbia. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-01375

EPA AND THE LIVESTOCK FEEDER,
National Livestock Feeders Association, Omaha, Nebr.
For primary bibliographic entry see Field 5G.
W76-01388

IMPACT OF ENVIRONMENTAL REGULATION ON THE LIVESTOCK INDUSTRY,
National Livestock Feeders Association, Omaha, Nebr.
For primary bibliographic entry see Field 5G.
W76-01389

RECOMMENDATIONS BY PACEM IN MARIBUS V TO THE U. N. CONFERENCE ON THE LAW OF THE SEA,
Center for the Study of Democratic Institutions, Santa Barbara, Calif.
E. M. Borgese.
Environmental Conservation, Vol 2, No 1, p 14-16, Spring, 1975.

Descriptors: *International law, *United Nations, *Law of the sea, International waters, Foreign countries, Exploitation, Mining, Regulation, Governments treaties, Political constraints, Manganese, Boundary disputes, Jurisdiction, Legal aspects, Administration, Minerology, Fishing, military aspects, International commissions, Beds.

entifiers: *Pacem in Maribus, *United Nations nference on the Law of the Sea(UCLOS), Disnament, Living resources, Water column.

e Fifth Pacem in Maribus Convention held in ptember 1974, once again emphasized that an ean regime must encompass the oceans as a hole and be considered as a sub-system of the tire global system. Four main areas of concern nerged: (1) the need for a more precise definition the limits of national jurisdiction; (2) problems management of national and international ocean ace; (3) the need to take full cognizance of scienic advances in framing the Law of the Sea' and conflicts and gaps in areas covered by the rking committees. Control of fishing and other ing resources, disarmanent and arms control in oceans, and international regulations as to the e of ocean space were other areas of concern. e main contention of Pacem in Maribus is that tivities on the sea-bed cannot be dissociated m activities in the water-column, at the surface, d at the atmospheric level. There must be an ingrated management system for ocean space. arrish-Florida)
76-01391

FORMER FEES UNDER THE REFUSE ACT: ECIDING WHO GETS WHAT,
. P. Buren.
vironmental Law, Vol 5, No 2, p 321-329, 1975, ref.

scriptors: *Rivers and Harbors Act, *Navigable ter, *Pollution abatement, Wastes, Environntal effects, United States, Water quality, doption of practices, Judicial decisions, Water llution control, Pollution taxes(Charges), gislation, Costs, Water pollution, Water pollun sources, Legal aspects, Law enforcement, ater quality control.
entifiers: *Informer's fees, *Fines, *Refuse Act 1899.

nder the Rivers and Harbors Act of 1899, one lf of the fine levied against an offender for scharging unauthorized refuse into the navigable ters of the United States is awarded to anyone ving information leading to the conviction of the fendant. In multi-count actions against modern dustrial polluters, however, there arises the posbility of frequent unearned windfalls to parties oviding relatively little evidence to the prosecun. Originally, only one form of discretion was fered courts in determining informers' fees der the act, that is, the power to decide if the inrmer 'qualified' as a provider of original infortion. A 1972 decision, United States v Anacon- Wire and Cable Co., appears to give courts de discretionary powers in determining the ount of the award as well. A claimant under aconda no longer must show he was the first inrmer; instead, the court may look to the 'totality the circumstances' to determine an appropriate ward. Further modification and clarification of Refuse Act in this area is likely. (Parrish-orida)
76-01392

ATER AS A TOOL IN LAND USE CONTROL, GAL CONSIDERATIONS: AN EXPLORATOY ESSAY,
hite and Burke, Fort Collins, Colo.
D. White.
cky Mountain Mineral Law Institute Annual, l 20, p 671-690, 1975. 60 ref.

scriptors: *Regulation, *Planning, *Land use, and resources, *Water policy, Water resources, atershed management, Local governments, ning, Permits, Judicial decisions, Legal aspects, litical aspects, Land, Land development, Land nagement, Water management(Applied), Water rmits, Water law.
entifiers: State policy, Water rights(Non-riparis), Nuisance(Legal aspects).

The issue to whether water resource planning or land resource planning should predominate in land use control has received little attention. Water supply can be controlled at the point of effluent discharge, at the water tap, and at the source of supply. Unrealistic water quality restrictions create a hardship on irrigation practices when control is exercised at the source of discharge. Efforts to alleviate pressure on inadequate municipal water and sewage treatment facilities by timephased zoning have drawn mixed judicial attention. Municipal regulation of watersheds often clashes with broader-based efforts. Condemnation of water rights may facilitate land use goals if money is available to compensate those whose water interests are condemned. Police power regulation which does not require compensation can be exercised through public nuisance legislation, zoning, and transferable development rights. The legal and institutional effects of policy decisions regarding water and land use controls need further exploration. (Jenkins-Florida)
W76-01393

DEPARTMENT OF ENVIRONMENTAL PROTECTION V JERSEY CENTRAL POWER AND LIGHT CO. (DAMAGES FOR FISH KILL FROM DISCHARGE OF COLD WATER INOT NORMALLY WARMED WATER),
5 ELR 20370-20373 (Super Ct. NJ App. Div., 1975). 4 p.

Descriptors: *Thermal pollution, *New Jersey, *Judicial decisions, *Industrial wastes, *Radioactive wastes, Cooling water, Industrial plants, Industrial water, Waste water treatment, Aquatic life, Ecology.
Identifiers: Atomic Energy Commission, Nuclear reactors.

After its nuclear generating plant was temporarily shutdown, the defendant continued to discharge cold rather than warm water from its pumps. Because of this cold discharge into the normally warmed waters of the creek, a large fish kill occurred. Defendant was convicted for a statutory violation for introducing a hazardous or destructive substance into state waters. In addition to statutory penalties, the state was allowed to receive, under the doctrine of parens patriae, compensatory damages for the fish kill. On appeal the defendant argued that the statute was unconstitutionally vague in that it did not specifically mention thermal pollution. The defendant also argued that the temporary shutdown that resulted in cold, rather than warm water being discharged, was necessitated by an Atomic Energy Commission (AEC) requirement that the reactor be shut down when the leakage of reactive coolant reached a certain level. The court rejected both arguments, and as to the second, found that the cold water pumping was not the result of the AEC directive, but was done to facilitate resumption of the generator operation after repairs had been completed. The continued discharge was held negligent under the circumstances, and the defendant was properly liable for compensatory damages. (Hoffman-Florida)
W76-01394

REGULATION OF GREAT LAKES WATER LEVELS, A SUMMARY REPORT, 1974.
International Joint Commission-United States and Canada. Great Lakes Levels Board.
For primary bibliographic entry see Field 4A.
W76-01395

WATER 'MINING' DECLARED UNLAWFUL UNDER IDAHO GROUND WATER STATUTE.
Rocky Mountain Mineral Law Newsletter, Vol 7, No 2, p 1-2, February 1974.

Descriptors: *Water policy, *Idaho, *Hydraulic mining water, *Judicial decisions, Legal aspects, Legislation, Exploitation, Water loss, Water consumption, Water management(Applied), Water allocation(Policy), Water control, Water utilization, Water resources, Water resources development, Water law.
Identifiers: *Injunctive relief.

In a full-scale review of Idaho underground water law, the Idaho Supreme Court determined that the provisions of the Idaho Ground Water Act forbid mining of an aquifer. Senior groundwater appropriators brought an action to enjoin junior appropriators who were pumping from their common aquifer. The trial court, on the basis of conflicting testimony of three hydrology experts, found certain priorities of development of the appropriators' wells. It determined that an injunction should issue to stop mining of the aquifer at rates greater than the annual recharge rate. On appeal to the Idaho Supreme Court appellants asserted that they were entitled to a pro-rata share of the water under the correlative rights doctrine and that the Ground Water Act only protected senior appropriators from unreasonable pumping levels by the juniors. The Court found that Idaho had expressly rejected that theory in 1931 and that the statutory scheme of the Idaho Ground Water Act had not reintroduced the doctrine. The Court concluded that the lower court's findings were supported by substantial evidence and affirmed. (Proctor-Florida)
W76-01396

ALASKA SUPREME COURT REJECTS BROAD STATE NAVIGATIONAL SERVITUDE NO-COMPENSATION RULE.
Rocky Mountain Mineral Law Newsletter, Vol 7, No 2, p 1-2, February 1974.

Descriptors: *Condemnation, *Eminent domain, *Judicial decisions, *Navigable waters, *Legal aspects, *Alaska, Cost repayment, Economics, Economic impact, Government, Water resources development, Water law, Bodies of water, Riparian rights, Riparian waters.
Identifiers: *Inverse condemnation, *Navigational servitude.

For 20 years, plaintiff had used a creek and the tides for access from his property to the deep waters of Cook Inlet for his commercial fishing boats. The State of Alaska constructed a federal aid highway across the creek and tideland blocking the high-tide water flow up the creek and destroyed the creek's navigability, as well as plaintiff's access to Cook inlet. Plaintiff sued for inverse condemnation. The lower court dismissed the complaint for failure to state a valid claim for relief because the state's action was a non-compensable taking pursuant to the state navigational servitude. The Court reviewed three general variations of the doctrine of navigational servitude. The general rule provides for compensation for taking unless the project is in aid of navigation. The public purpose variation prohibits compensation if the project is for any public purpose. The Louisiana exception is applicable solely to that state. The court adopted a restricted version of the general rule allowing compensation if property is taken for a non-navigable purpose. (Proctor-Florida)
W76-01397

OPTIMAL ENVIRONMENTAL JURISDICTIONS,
Roosevelt Univ., Chicago, Ill.
R. O. Zerbe.
Ecology Law Quarterly, Vol 4, No 2, p 193-245, 1974. 3 tab, 22 ref.

Descriptors: *Federal jurisdiction, *Local governments, *Optimization, *State jurisdiction, *Political constraints, Water pollution control, Air pollution, Environmental control, Pollution abatement, Property values, Industries, Social aspects, Land use, Political aspects, Water rights, Governmental interrelations, Jurisdiction.

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Identifiers: Monopsony, Economic incentives, Administrative regulations, Environmental policy, Water rights(Non,riparian), Local jurisdiction, Federal Water Pollution Control Amendments of 1972, Auto emission control, Optimal environmental jurisdictions.

Effective environmental controls depend partially on the control jurisdiction. The federal government's power over air and water resources greatly exceeds that of state and local government. The capacity for local pollution control has been underestimated. In determining the optimum jurisdictional arrangement, net social benefits rather than exclusively political values should be considered. Local incentives for pollution control may be present where pollution causes a decrease in property values and local revenue. Exclusionary zoning standards which are too severe may divide a community along income lines with the adverse effects of control felt by lower income groups. Competition among localities for new industry does not mitigate incentives for local environmental control but is a desire equilibrating process. Local environmental control will also benefit nonresidents through pricing signals. Another issue of control jurisdiction is that of undue uniformity of federal pollution standards. Such uniformity is often inefficient and inequitable. One example is motor vehicle pollution standards. A control jurisdiction must be large enough to eliminate important interjurisdictional pollution and take advantage of scale economics. Air and water pollution control can be maximized by regional or local jurisdiction. Federal jurisdiction over research, however, remains desirable. (Jenkins-Florida)
W76-01398

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-01399

A PRIMER ON THE BOUNDARY WATERS TREATY AND THE INTERNATIONAL JOINT COMMISSION,
P. Pantaleo.
North Dakota Law Review, Vol 51, No 2, p 493-508, 1974. 145 ref.

Descriptors: *International Joint Commission, *Treaties, *International law, *Canada, *United States, *Salinity, Water quality, Water properties, Legal aspects, Foreign waters, International waters, Foreign countries, Jurisdiction, Water pollution, Water law, Path of pollutants, Water pollution effects, Water pollution control, Water pollution sources, Water quality control, Organization, Saline water intrusion.
Identifiers: Garrison Diversion Project, *Boundary Waters Treaty of 1909, Nuisance(Legal aspects).

Discussed are possible legal avenues available to Canada through the Boundary Waters Treaty of 1909 and the International Joint Commission for problems caused by the Garrison Diversion Project which has increased the salt level of the Souris River. The appliability of the treaty to Canadian objections to Garrison Diversion is examined by outlining the history of the treaty and the reasons for its formulation. A detailed analysis is presented of the organization functions and procedures of the International Joint Commission established by the treaty. It is concluded that an individual Canadian injured by the Garrison Diversion Project would have no problem suing in an American court on a nuisance theory. Another alternative a Canadian might pursue would be securing the intervention of his government on his behalf. The Canadian government could secure the investigation of the alleged pollution by the Commission or attempt to secure the consent of the United States government to arbitration under which both countries would be bound by the arbitration decision. (Nursey-Florida)
W76-01400

HAWAIIAN BEACH ACCESS: A CUSTOMARY RIGHT,
M. D. Tom.
Hastings Law Journal, Vol 26, No 3, p 823-847, 1975. 172 ref.

Descriptors: *Hawaii, *Beaches, *Public access, *Easements, Water law, Legal aspects, Coasts, State governments, Legislation, Judicial decisions, Constitutional law, Common law, Public rights, Equity, Land tenure, Trespass, Seashores, History, Recreation.
Identifiers: *Customary right doctrine, Public trust doctrine, Hawaiian legal history, Estoppel, Piscary rights.

Commercial development in Hawaii has significantly reduced public access to the state's beaches. To obtain an effective balance between the conflicting interests of the public and the upland owners, a customary right doctrine should be utilized to establish a public right of beach access, and a traditional abandonment concept should be applied to protect upland private property rights. Through the customary right doctrine, particular local custom can acquire the force of law. The development of the doctrine is traced and its applicability is considered in light of Hawaiian history, judicial decisions, and legislation. The requirements for application of the doctrine are discussed, both generally and within the context of Hawaiian law. Hawaiian decisions concerning piscary and water rights are examined, and the conclusion reached that the customary right of beach access was historically a public right which the sovereign could not convey. Recent cases concerning beach ownership are discussed, as are the constitutional issues relevant to the proposal presented. Where appropriate, the Hawaiian courts can protect the rights of upland owners by curtailing or modifying the access right through the doctrine of extinguishment. (Schilling-Florida)
W76-01401

LAWMAKING FOR THE SEAS,
J. R. Stevenson.
American Bar Association Journal, Vol 61, p 185-190, February 1975. 1 photo, 2 ref.

Descriptors: *United Nations, *International law, *Law of the sea, *Negotiations, Treaties, Legal aspects, Water rights, Boundary disputes, Governments, International waters, Navigation, Fishing, Resources, Organizations, Foreign countries, Foreign waters, Water law, Oceans.
Identifiers: *Coastal waters, *United Nations Conference on the Law of the Sea.

The Third United Nations Conference on the Law of the Sea is discussed. The fundamental task of this conference is to agree on a local regime governing the activities of men and nations on the world's oceans. The law of the sea negotiations are described as an example of the international lawmaking process and those aspects of the process that appear to be most constructive in facilitating agreement on a constitution for the oceans are discussed. The spiral of competing and escalating claims to the use of the same ocean space and resources have made it necessary to have a system of international as opposed to national law for the world's oceans. The most viable solution to this lawmaking for the oceans is a comprehensive multilateral treaty. All areas of dispute should be resolved within one document rather than individual agreements which serve the special interests of particular nations. The international lawmaking procedures followed may also contribute to the ultimate success or failure of the conference. The following procedural aspects are discussed: (1) decision making; (2) the role of committees and working groups; and (3) the establishment of rule-making machinery and compulsor dispute settlement (Nursey-Florida)
W76-01402

LEGAL REMEDIES FOR POLLUTION ABATE MENT,
Missouri Univ., Columbia
For primary bibliographic entry see Field 5G
W76-01403

CEMENT PRODUCERS CONFRONT ANTI POLLUTION LEGISLATION,
G. L. Koonsman
Rock Products, Vol 74, p 161-162, 184, 186, October 1971. 1 photo

Descriptors: *Concrete technology, *Rivers an Harbors Act, *Industrial wastes, Wast water(Pollution), Slurries, Water pollutio sources, Navigable waters, Permit, Legislatior Law enforcement, Water requirements, Coolin water, Industrial water, Water supply, Wate treatment, Waste water disposal, Environmenta sanitation.

The Rivers and Harbors Act of 1899 prohibits th discharge of refuse matter into any navigabl water without a permit from the Secretary of th Army. One-half of the fine collected is paid to th person or persons whose information leads to conviction under the Act. All cement plants us and discharge water. As pollutors, they will fin more and more concern being given to the quality of water they discharge. Cement plants use wate for such purposes as cooling, dust collection, dus leaching, cleaning and fire protection. If disposa of the soils is not handled carefully, it may be i violation of the Rivers and Harbors Act. In addi tion two hundred and fifty residents are filling ou federal water quality questionnaires which seel various types of information. Industry has shown concern over the questionnaire on two points. Wil the information be kept confidential, and will it be used for enforcement purposes. The questionnaire and the Rivers and Harbors Act combined may be the means used to force industry to divulge per tinent data in applying for a permit. (Sperling Florida)
W76-01404

MARTIN-TRIGONA V. RUCKELSHAUS (CHALLENGE OF EXECUTIVE IMPOUNDMENT OF FWPCA FUNDS).
1 Pollution Control Guide, Vol 3, paragraph 15023 p 15211-15216, 1973.

Descriptors: *United States, *Government finance, *Administrative agencies, *Administrative decisions, Budgeting, Legal aspects, Administration, Treatment facilities, Construction, Jurisdiction, Decision making, Regulation, Coordination.
Identifiers: *Impoundment, Standing(Legal), Sovereign immunity, Justiciable controversy.

The federal district court ordered the Environmental Protection Agency Administrator to allot among the states all sums designated by Congress for sewage treatment works construction projects approved by the Administrator for federal funding. A private citizen has legal standing to compel the Administrator to expend these sums. Citizen suits are available to compel the Administrator to perform a nondiscretionary act or duty. The doctrine of sovereign immunity as a defense to the courts assertion of jurisdiction is inapplicable in a suit which challenges action by a federal officer that allegedly goes beyond the scope of that officer's statutory power. The sovereign immunity defense can only be asserted when the judgment may force an expenditure from the public treasury. The Administrator's refusal to make a full allotment of appropriated sums produces interests sufficiently adverse, and a legal issue of sufficient immediacy and reality to create a justiciable controversy. (Sperling-Florida)

W76-01405

ENVIRONMENTAL DEFENSE FUND, INC. V. CALLAWAY (SEEKING DECLARATION THAT FINAL ENVIRONMENTAL IMPACT STATEMENT FOR DAM AND RESERVOIR WAS INADEQUATE UNDER NEPA).
97 F.2d 1340 (8th Cir 1974).

Descriptors: *Missouri, *Federal jurisdiction, Judicial decisions, *United States, *Legislation, Reservoir, Standards, Adoption of practices, Construction, Legal review, Law enforcement, Regulation, Governmental interrelations, Economic aspects, Decision making.
Identifiers: *National Environmental Policy Act, Environmental Impact Statements, Declaratory relief(Legal aspects), Injunctive relief(Legal aspects).

This was an action arising out of the United States District Court for the Western District of Missouri seeking declaratory and injunctive relief against the Secretary of the Army. At issue is the sufficiency of the final environmental impact statement for the Army Corps of Engineers' Harry S. Truman Dam and Reservoir Project being built on the Osage River. The district court refused to grant injunctive relief. On appeal the trial court's determination that the environmental impact statement met the standards of the 1969 National Environmental Policy Act was affirmed. The court also affirmed the taxing of costs. The district court assessed the costs against each party up to the date of the first decision that an environmental impact statement was necessary for the project. (Sperling-Florida)
W76-01406

AMERICAN PLANT FOOD CORP. V. STATE OF TEXAS (APPEAL FROM CRIMINAL CONVICTION FOR POLLUTION OF WATERS).
508 S.W.2d 598 (Tex. App. 1974).

Descriptors: *Water pollution, *Water pollution sources, *Legislation, *Judicial decisions, Waste disposal, Effluents, Sewage, Industrial wastes, Texas, Water law, Water resources development.
Identifiers: Due process, US Constitution, Criminal sanctions.

The defendant corporation was convicted of water pollution under a Texas criminal statute, and appealed. Appellant alleged inter alia that the statute under which the conviction was obtained was unconstitutionally indefinite and vague. The court rejected that contention, as well as allegations of lack of due process, and statutory conflict and affirmed the trial court on all grounds. (Proctor-Florida)
W76-01407

ATZGER V. CLERMONT COUNTY BOARD OF COMMISSIONERS (SUIT FOR DAMAGES FOR OVERFLOW OF WATER FROM WATER TOWER).
318 N.E.2d 421 (Ohio App. 1974).

Descriptors: *Overflow, *Water storage, Negligence, *Towers, *Damages, Municipal water, Judicial decisions, Legal aspects, Accidents, Risks, Seepage, Water loss, *Ohio.
Identifiers: Sovereign immunity, Injunction.

Plaintiffs sought monetary and injunctive relief against the board of county commissioners for overflow of water from a water tower maintained by the county on adjoining property. The trial court granted injunctive relief, but denied monetary damages. The Court of Appeals of Ohio affirmed, holding that in absence of a statute fixing liability, boards of county commissioners are immune from tort liability. (Denvir-Florida)
W76-01408

6F. Nonstructural Alternatives

NONSTRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT, WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY,
Cheney, Miller, Ellis and Associates, Inc., Putnam, Conn.
P. B. Cheney, D. A. Yanggen, P. M. Glick, and H. C. Miller.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238-498, $7.75 in paper copy, $2.25 in microfiche. Prepared for New England River Basins Commission, Boston, Mass. Working paper, February 28, 1974. 182 p, 17 fig, 11 tab, 34 ref. CRSS-NERBC 1.2-4E. NERBC 1.2-4E.

Descriptors: *Planning, *Non-structural alternatives, *Connecticut River, *Flood plains, *River basin development, *Flood proofing, Management, *Land management, Flood control, Flood protection, Flood plain insurance, Water zoning, Building codes, Governments, Legislation, New Hampshire, Massachusetts, Connecticut.
Identifiers: *Flood plain management, New England River Basin Commission.

After identifying the present national flood plain situation and management tools within an institutional framework, Part I of this report details nonstructural techniques for flood management in the Connecticut River Basin and discusses their advantages and limitations along with the effectiveness of existing and proposed programs for nonstructural management at the state level in the basin. A flood plain management system depends upon the area's physical characteristics as well as the weight given to social and environmental objectives. Alternatives to structural works such as flood proofing, urban redevelopment, permanent evacuation, and governmental regulatory measures can control the amount and type of growth which will be subject to flood damage. Passage of national land use policy legislation will provoke the states to implement flood plain management programs. Part II contains the framework for applying information on non-structural measures to actual flood plain situations in the Basin and a discussion of selected examples of non-structural flood management at the community level. The study focuses upon the technical feasibility of the measures, their ability to meet the objectives of flood management and their implications from the standpoint of implementation costs. This framework for regulating flood plains will serve as an aid for developing comprehensive plans for the Connecticut River Basin (Salzman-North Carolina)
W76-01345

SPECIAL FLOOD HAZARD REPORT: CAMPBELL CREEK, GREATER ANCHORAGE AREA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-01361

FLOOD PLAIN INFORMATION: ALISO CREEK, ORANGE COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-01362

SPECIAL FLOOD HAZARD INFORMATION: BEAR AND EVANS CREEKS, REDMOND AND VICINITY, WASHINGTON.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W76-01363

FLOOD PLAIN INFORMATION: EIGHT MILE CREEK, VICINITY OF PARAGOULD, ARKANSAS.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W76-01364

FLOOD PLAIN INFORMATION: PART I - BAYOU BARTHOLOMEW AND TRIBUTARIES, CITY OF PINE BLUFF, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-01365

SPECIAL FLOOD HAZARD INFORMATION: WOLF LODGE CREEK AND TRIBUTARIES, VICINITY OF COUER D'ALENE, IDAHO.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W76-01367

FLOOD PLAIN INFORMATION: POCOSHOCK AND POCOSHAM CREEKS, CITY OF RICHMOND AND CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W76-01368

FLOOD PLAIN INFORMATION: CASPER, WYOMING, VOLUME III, NORTH PLATTE RIVER.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-01369

FLOOD PLAIN INFORMATION: ST. JOE AND ST. MARIES RIVERS, CITY OF ST. MARIES AND VICINITY, IDAHO.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W76-01370

SPECIAL FLOOD HAZARD REPORT: TO REVISE FLOOD PLAIN INFORMATION, METROPOLITAN REGION, DENVER, COLORADO; VOLUME II: SAND, TOLL GATE AND LOWER CHERRY CREEKS, SOUTH PLATTE RIVER BASIN.
Army Engineer District, Omaho, Nebr.
For primary bibliographic entry see Field 4A.
W76-01371

FLOOD PLAIN INFORMATION: PROCTORS CREEK, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W76-01372

FLOOD PLAIN INFORMATION: SAN LORENZO RIVER, BOULDER CREEK-FELTON, SANTA CRUZ COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-01373

FLOOD PLAIN INFORMATION: APTOS, TROUT AND VALENCIA CREEKS, CITY OF APTOS, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-01374

WATER AS A TOOL IN LAND USE CONTROL, LEGAL CONSIDERATIONS: AN EXPLORATORY ESSAY,
White and Burke, Fort Collins, Colo.
For primary bibliographic entry see Field 6E.

LIBRARY U. OF I. URBANA-CHAMPAIGN

W76-01393

STILLWATER RIVER AND ROSEBUD CREEK FLOOD HAZARD ANALYSES, STILLWATER COUNTY, MONTANA.
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 2E.
W76-01483

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL IMPACT STATEMENTS IN PLANNING WATER AND RELATED LAND RESOURCES,
State Univ. of New York at Syracuse. Coll. of Environmental Sciences and Forestry.
P. E. Black.
Water Resources Bulletin, Vol 11, No 5, p 881-886, October 1975. 2 tab, 18 ref.

Descriptors: *Water resources development, *Planning, *Environment, Land resources, Evaluation, Ecology, Forecasting, Cost-benefit analysis, Cost-benefit ratio, Economics, Water policy, Risks.
Identifiers: *Environmental impact statement, Principles and standards (WRC), Resource use, NEPA, Uncertainty, Multiple objectives.

The history of water and related land resources planning suggests that environmental and economic considerations should be kept separate. Attempts to evaluate 'intangibles' in the benefit-cost analysis and to include economics in environmental evaluation cloud the issue. The benefit-cost analysis is represented by a simple ratio; efforts to balance it by a verbose statement of complex ecological description and environmental interactions does not clarify the problem. The uncertainties of ecological forecasting are no worse than those associated with economic forecasting. A properly constructed environmental impact statement can be effective in planning resource use and can consequently lead naturally to the consideration of a broader range of governmental actions than is presently the case. The impact statement should not be an encyclopedia of the local ecology; rather, it should accurately represent the environment which the action will impact and thoroughly analyze only the potential impacts of the proposed action and its alternatives on that environment. The first step is to develop a 'tiered' approach to policy, programs, projects, and practices involving resources development, so that unnecessary duplication of analysis and reporting is eliminated, and so that each statement deals only with the action, environment, and impact at hand. Impacts may be classified according to importance, magnitude, and probability, etc. (Bell-Cornell)
W76-01333

ENVIRONMENTAL RECONNAISSANCE TECHNIQUES FOR CONNECTICUT RIVER BASIN WATERSHEDS,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 4D.
W76-01344

ENVIRONMENTAL HAZARDS OF LARGE SCALE WATER DEVELOPMENTS,
Geological Survey, Raleigh, N.C.
R. L. Nace.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 3-18, 1974. 1 tab, 18 ref.

Descriptors: *Environmental effects, *Dams, *Post impoundment, *Earthquakes, *Impoundments, *Diversion, Environmental engineering, *Africa, Water pollution, Management, Water distribution, Water sources, Water control
Identifiers: River impoundments, Climate modification, North American Water and Power Alliance(NAWAPA), African Sea, Earth wobble, Geostatic loading, Siberian River, Great South American Lakes.

Consequences of water projects on the environment are rarely accounted for in the development and construction of the project. Several examples of unwanted and unforeseen effects such as environmental destruction and disruption, epidemic spread of endemic disease, and economic, social and political disruption of human institutions are documented. River impoundments and diversions emphasize the possibilities of environmental degradation occurring due to lack of policy and planning. Water power proposals often ignore forces that could be set in motion in response to immutable natural laws. Besides modifying landscapes and upsetting local and regional ecology, more drastic effects such as climate changes, earth wobble, and earthquakes caused by geostatic loading imposed usually by large dams and less frequently by reservoirs can result. These environmental effects are caused by irrigation,power production and river impoundments for recreation and water supply. Documented areas affected include the Northern American Water and Power Alliance (NAWAPA), the Siberian River Diversion, the Great South American Lakes project and the African Sea. Knowledge about natural processes is too limited to permit accurate foresight even of local and regional effects, let alone possible continental and global hazards. (See also W76-01347) (Salzman-North Carolina)
W76-01348

OPTIMAL ENVIRONMENTAL JURISDICTIONS,
Roosevelt Univ., Chicago, Ill.
For primary bibliographic entry see Field 6E.
W76-01398

ENVIRONMENTAL DEFENSE FUND, INC. V. CALLAWAY (SEEKING DECLARATION THAT FINAL ENVIRONMENTAL IMPACT STATEMENT FOR DAM AND RESERVOIR WAS INADEQUATE UNDER NEPA).
For primary bibliographic entry see Field 6E.
W76-01406

SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 8D.
W76-01409

ZUMBRO RIVER BASIN, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 8A.
W76-01411

BAYOU BODCAU AND TRIBUTARIES, ARKANSAS AND LOUISIANA ASSOCIATED WATER FEATURES, RED RIVER, BAYOU BODCAU, FLAT RIVER, RED ETC....(FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8A.
W76-01412

OCEAN OUTFALLS AND OTHER METHODS OF TREATED WASTE-WATER DISPOSAL IN SOUTHEAST FLORIDA, (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5D.
W76-01413

SAINT FRANCIS BASIN PROJECT, ARKANSA AND MISSOURI, (ENVIRONMENTAL IMPAC STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 8A.
W76-01414

7. RESOURCES DATA

7A. Network Design

PROCEDURES FOR THE OPTIMUM USE O GEOPHYSICAL METHODS IN GROUNI WATER DEVELOPMENT PROGRAMS,
Pretoria (South Africa). National Physical Researc Lab.
For primary bibliographic entry see Field 2F.
W76-01125

OPTIMIZING INFORMATION TRANSFER IN STREAM-GAGING NETWORK,
Geological Survey, Reston, Va.
P. H. Carrigan, Jr., and H. G. Golden.
Available from National Information Service Springfield, Va 22161 as PB-245-190 as $3.50 paper copy, and $2.25 in microfiche. Water Resources Investigations 30-75, September 197 25 p, 8 fig, 7 tab, 9 ref.

Descriptors: *Stream gages, *Streamflow *Network design, *United States, *Compute models, Data collections, Operations research Streamflow forecasting, Gaging stations, Optimization, Correlation analysis, Streams, Illinois Georgia, Montana.
Identifiers: Mixed integer programming.

Networks of small stream (less than 50 sq mi gages have been operated by the Geological Survey throughout the country for a number of years to supplement flood information for large streams The goal in operation of these networks has been to obtain sufficient data for estimating flood frequency at ungaged sites with the equivalent accuracy expected from 10 years of observed flood records. Most networks have accumulated sufficient data to satisfy these accuracy requirements A review is made of these data for possible reduction of the number of gages in the networks Thomas Maddock in 1974 developed a rational method for selecting gages to be retained in a reduced hydrologic network. This method of network analysis will result in selecting the optimum set of gages retained for a given level of annual operating costs with the information content of the reduced network being the factor optimized. Maddock's method of analysis is described and its use described in detail for a hypothetical network in Illinois, Georgia, and Montana. (Woodard-USGS)
W76-01187

METHODS AND DATA REQUIREMENTS FOR RIVER-QUALITY ASSESSMENT,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 5A.
W76-01334

7B. Data Acquisition

REMOTE SENSING TECHNIQUES FOR EVALUATION OF SOIL WATER CONDITIONS.
South Dakota State Univ., Brookings. Remote Sensing Inst.
F. A. Schmer, and H. D. Werner.
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 2, p 310-314 March-April 1974. 6 fig, 3 tab, 8 ref.

Descriptors: *Remote sensing, *Soil moisture *Grain sorghum, Films, Filters, Infrared radiation, Wavelength, Reflectance, Irrigation, Agriculture, Irrigation practices, Soil water, *Water analysis, Evaluation.

dentifiers: *Multispectral imagery, *Crop anopy, *Spectral bands.

The results of two years of soil water research indicate that remote sensing did provide a valuable tool in evaluation of soil water condition for the crop and soils studied. Multispectral data collection and analysis seem to hold the key to the development of the necessary remote sensing techniques for operational use. Results indicate that early season soil water conditions with little crop cover of the soil were best monitored with the blue spectral band. As the season progressed and the crop canopy developed, the sorghum became an indicator of the available soil water; and the green and red spectral bands became more useful with red the best of all. Adjusting the film densities from the reflected imagery to account for variations in incoming radiation provided improved results in several cases. Thermal infrared radiation may possibly be the most valuable tool for widespread soil water evaluation since it seems less affected by difference in vegetative and soil surfaces. (Skogerboe-Colorado State)
W76-01067

SOIL TEMPERATURE MODELING USING AIR TEMPERATURE AS A DRIVING MECHANISM,
Wyoming Univ., Laramie. Dept. of Civil Engineering.
V. R. Hasfurther, and R. D. Burman.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 1, p 78-81, January-February 1974. 6 fig, 1 tab, 1 append.

Descriptors: *Model studies, *Mathematical models, *Soil temperature, *Air temperature, Temperature, Climatic data, Agriculture, Forecasting.
Identifiers: *Soil temperature modeling.

A mathematical model for predicting soil temperature from air temperature is developed and should have great utility because of the availability and economy of air temperature measurements as compared to soil temperature measurements. The mathematical model will predict daily average soil temperatures within approximately three degrees Farenheit at depths of from 1 inch to 72 inches based on past measurements of average daily air temperature as reported by a standard weather bureau shelter. Prediction of future soil temperatures is largely limited by the accurate prediction of air temperatures in advance. The results of the mathematical modeling technique show that the deviations of predicted values from the actual values (smoothed values) were usually within three degrees and more often than not were less than three degrees in error. (Skogerboe-Colorado State)
W76-01079

CONTROLLING CENTER PIVOT SPRINKLERS FOR EXPERIMENTAL WATER APPLICATION,
Agricultural Research Service, Fort Collins, Colo.
D. F. Heermann.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2552, American Society of Agricultural Engineers. St. Joseph, Michigan, 23 p, 7 fig, 7 tab.

Descriptors: *Sprinkler irrigation, *Research equipment, Data collections, Application equipment, Application methods, Irrigation methods, *Irrigation practices, Irrigation, Farm management, Management, Water control, *Control systems.
Identifiers: Center pivot sprinklers.

Irrigation systems and techniques are often required for various water treatments for water management research. Center pivot irrigation systems were successfully modified to vary water application depths on droplet size on small plots or entire sectors. The modifications included controls for varying travel speed and for automatically starting and stopping individual sprinkler heads. The modifications made on center pivot systems for three different experiments were successfully used for applying water treatments. When systems were run at constant rotation speeds, the coefficient of variability was generally less than 20%. Water treatments applied with center pivot systems required minimal labor since the systems were designed to automatically effect the desired treatments as the systems passed over the plot areas. (Skogerboe-Colorado State)
W76-01080

THE UTILITY OF SURFACE TEMPERATURE MEASUREMENTS FOR THE REMOTE SENSING OF SURFACE SOIL WATER STATUS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-01121

THE APPLICATION OF ICE PHYSICS TO GLACIER STUDIES,
Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
For primary bibliographic entry see Field 2C.
W76-01250

APPLICATION OF ISOTOPE TECHNIQUES TO GLACIER STUDIES,
Alberta Univ., Edmonton. Dept. of Physics.
For primary bibliographic entry see Field 2C.
W76-01252

MECHANICAL SNAKE RIVER UNDISTURBED SOIL CORE SAMPLER,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
C. W. Hayden, and C. W. Robbins.
Soil Science, Vol 120, No 2, p 153-155, August 1975. 3 fig, 1 ref.

Descriptors: *Soil investigations, *Core drilling, Hydraulic conductivity, Power head, Sampling, Tubes, Mechanical equipment, Soils.
Identifiers: *Mechanical sampler, *Snake River Sampler, Undisturbed sampling, Power-driven sampler, Cutting tip, Split sleeve, Hand operation, Auger tubes.

The hand-operated Snake River Sampler for obtaining undisturbed soil cores in the upper 50 cm of soil was reported in 1968. Described here was a newer sampler which had the ability to sample bedrock at a depth of 5 m by adding an outside auger tube without having to pull the entire sampling equipment out of the soil. A direct-drive 9 hp gasoline motor with a centrifugal clutch powered the drilling unit. A cutting tip permitted an inside sample tube to remain stationary while the outside auger tube removed the soil away from the sample. The sample tube and split sleeve holder had a slightly larger diameter than the spring steel cutting tip. This allowed the sample to slip into the split sleeve holder without any distortion or compaction. The dimensions described were optional, and it would be advisable to use a larger power unit if sampling to greater depths were necessary. The unit could be converted to, or mounted on, a small trailer. This made the sampler highly maneuverable for sampling in areas where larger units could not operate. Difficulty could be encountered in sampling very dry or gravelly soils. (Roberts-ISWS)
W76-01272

CLASSIFYING STORM RUNOFF POTENTIAL WITH PASSIVE MICROWAVE MEASUREMENTS,
Agricultural Research Service, Chickasha, Okla.
B. J. Blanchard, J. W. Rouse, Jr., and T. J. Schmugge.
Water Resources Bulletin, Vol 11, No 5, p 892-907, October 1975. 3 fig, 3 tab, 23 ref.

Descriptors: *Storm runoff, *Microwaves, Soils, Watersheds(Basins), Soil moisture, Vegetation, Soil texture, Runoff coefficient, Remote sensing, Runoff, Measurement, Hydrology.
Identifiers: *Storm runoff potential, *Microwave measurements, Surface roughness, Vegetative cover, Watershed runoff, Microwave imaging.

The average microwave temperature of the watershed surface as detected by an airborne Passive Microwave Imaging Scanner (PMIS) was compared with the measured Soil Conservation Service (SCS) watershed storm runoff coefficient. Previous laboratory work suggested that microwave response to the watershed surface was influenced by some of the same surface characteristics that affect runoff, i.e., soil moisture, surface roughness, vegetative cover, and soil texture. In order to field test and develop relations between runoff potential and microwave response, several highly instrumented watersheds of approximately 1.5 to 17 sq km were scanned under wet- and dry-soil conditions in April and June 1973. The polarized (horizontal and vertical) scans at 2.8 cm wavelength provided the data base from which other values were calculated. The best relationship between runoff coefficients and PMIS temperatures was observed when horizontally polarized temperatures from the near-dormant, early-growing season flight were used. Lower SCS runoff coefficients seemed to be correlated with the cross-polarized response under dry watershed conditions late in the growing season and the difference in horizontal polarized response between wet conditions early in the growing season and dry conditions late in the growing season. (Roberts-ISWS)
W76-01306

USE OF ERTS-1 IMAGERY TO INTERPRET THE WIND EROSION HAZARD IN NEBRASKA'S SANDHILLS,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 2J.
W76-01309

AN EVALUATION OF SEDIMENT TRAP METHODOLOGY,
Toronto Univ., Ontario (Canada), Dept. of Zoology.
For primary bibliographic entry see Field 2J.
W76-01313

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS, FEBRUARY 1973,
Canada Centre for Remote Sensing, Ottawa (Ontario). Data Acquisition Div.
For primary bibliographic entry see Field 5A.
W76-01324

A SURVEY FOR THE USE OF REMOTE SENSING IN THE CHEMICAL BAY REGION,
Maryland Univ., Solomons. Chesapeak Biological Lab.
For primary bibliographic entry see Field 5B.
W76-01327

COMPARISON OF SOME CALCULATION METHODS FOR RAINWATER RUNOFF (VERGLEICH EINIGER BERECHNUNGSMETHODEN VON REGENWASSERKANALISATIONEN),
For primary bibliographic entry see Field 2A.
W76-01426

EVOLUTION OF OPERATION CONTROL IN WATER TREATMENT (A VIZTISZTITASI TECHNOLOGIAK UZEMIRANYITASANAK FEJLODESE),
For primary bibliographic entry see Field 5D.
W76-01450

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A PHOTOGRAPHIC TECHNIQUE FOR MEASUREMENTS OF ATMOSPHERIC PARTICLES IN SITU FROM AIRCRAFT,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W76-01472

GAMMA--THE PSYCHROMETER NON-CONSTANT,
Atmospheric Environment Service, Calgary (Alberta).
For primary bibliographic entry see Field 2D.
W76-01473

A HYDROPHOBIC MEMBRANE PROBE FOR TOTAL PRESSURE AND PARTIAL PRESSURE MEASUREMENTS IN THE SOIL ATMOSPHERE,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
For primary bibliographic entry see Field 2G.
W76-01480

7C. Evaluation, Processing and Publication

INVENTORY OF POTENTIAL AND EXISTING UPSTREAM RESERVOIR SITES, TAUNTON AND NARRAGANSETT BAY STUDY AREAS.
Soil Conservation Service, Amherst, Mass.
USDA and Massachusetts Water Resources Commission, January 1974. 194 p, 41 fig, 17 tab, 11 ref, append.

Descriptors: *Reservoir sites, *Reservoirs, *Potential water supply, *Massachusetts, Safe yield, Artificial lakes, Feasibility studies, Hydraulic structures, Hydrology, Cost analysis.
Identifiers: *Reservoir site inventory, *Narragansett Bay, *Taunton Bay, Reservoir costs.

Data on 81 potential and 160 existing reservoirs were presented. One of a series dealing with reservoir sites in Massachusetts dating back to 1965, the study covers a 699 sq mi area divided into 16 subwatersheds. The selection criteria for potential reservoir sites, including drainage areas between 0.5 and 50 sq mi, were documented. Sites were located on 7.5-minute quadrangle maps. A field reconnaissance was made at each site to determine the potential effects on man-made structures. An approximate total development cost was made for each site based on 1972 land values. Surficial geologic investigations were also made at each potential reservoir site. The hydrologic and hydraulic studies provided type of principal spillway, the 100-year peak flow, and the safe yield of the reservoir for water supply purposes. Maps showing the location of each potential and existing reservoir as well as their respective drainage areas were presented for each subwatershed. For each existing reservoir, a field reconnaissance was made to determine the physical condition of the structure and to assess the potential for expansion. Selected photographs were included, as well as information on ownership and use. (Terstriep-ISWS)
W76-01269

STEP-DRAWDOWN TEST ANALYSIS BY COMPUTER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-01300

USE OF ERTS-1 IMAGERY TO INTERPRET THE WIND EROSION HAZARD IN NEBRASKA'S SANDHILLS,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 2J
W76-01309

CALIFORNIA HIGH WATER, 1972-1973,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development
For primary bibliographic entry see Field 2E
W76-01315

ADAMS COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
B. Dunn.
December 1972. 64 p, 16 fig, 14 tab, 26 ref.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Water pollution, Streams, Lakes, Climates, Geology, Drainage, Soils, Impoundments, Ponds, Water quality, Fisheries, Fish Recreation, Sport fishing, Commercial fishing, Boating, Public access, Hunting, Reservoir sites, Water levels.
Identifiers: *Adams County(Ill).

Adams County, located in west-central Illinois along the Mississippi River, is 866 sq m in area. It has a population of 68,467 people, two-thirds of which reside in Qunicy. With the exception of industrialized Quincy, the county is agriculturally oriented. The climate is generally mild with an average annual temperature of 55F. Precipitation averages 35-36 in annually. Water resources total approximately 2267 artificial impoundments (1533.8 acres), 35 natural lakes (840.8 acres), and 24 streams (625.5 acres). There are numerous pond and lake sites for potential recreational development. Nineteen potential lake sites have been proposed as feasible and an additional eight have been included in the McKee Creek Watershed Project. Recreation is generally centered along the Mississippi River where approximately 16,100 acres of water are open to public use. Siloam Springs State Park is also heavily used. Sales of fishing and boating licenses have increased in the past few years, but hunting licenses sales have dropped due to the 1968 gun owners registration law. Water quality is generally good; pollution problems are not serious, although there are problem areas. Only one fish kill (undetermined origin) has been reported in recent years. Agricultural problems of soil erosion, pesticides, and animal wastes probably present more of a potential threat than industrial and municipal wastes. Development of recreational areas within the county seems promising. (Robinson-ISWS)
W76-01317

HENDERSON COUNTY SURFACE WATER RESOURCES,
Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
K. Russell.
December 1971. 86 p, 15 fig, 17 tab, 51 ref, 3 append.

Descriptors: *Surface waters, *Water resources, *Illinois, *Data collections, Streams, Lakes, Ponds, Impoundments, Rivers, Mississippi River, Drainage, Soils, Climates, Geology, Fish, Fishing, Sport fishing, Commercial fishing, Recreation, Boating, Hunting, Wildlife, Water quality, Water pollution, Thermal stratification, Damsites, Water levels, Public access.
Identifiers: *Henderson County(Ill).

Henderson County, located in northwestern Illinois with a land area of 381 sq mi, is essentially separated into three distinct regions: A flat to undulating upland plain, a rugged bluff region, and the low-lying Mississippi River plain. The climate is characterized by a very wide range in temperature and an abundant rainfall. Surface drainage is divided by the Mississippi and Illinois River systems, but the latter drains only 15 sq mi in the extremed southeast corner of the county. The current surface water inventory of Henderson County, which includes all major streams and impoundments, is 12,753.7 acres or 5.2% of the total land area. The Mississippi River on the Henderson County side of the main channel has a total length of 36.4 miles with an area of 11,342.8 acres. On a acreage basis, approximately 54% of the 996 acres of impounded surface water is classified under private ownership. New Crystal Lake, with its 375 acres of marsh and open water, is the largest single surface water impoundment and is operated as a hunting and fishing club. Gladstone Lake, operated by the Illinois Department of Conservation, is the only public impoundment offering multiple use water oriented recreation. Henderson Creek is the major stream, draining approximately 583 sq mi in west-central Illinois. Boating, fishing and hunting are the most popular water-based sports. The future of Henderson County's surface water resources requires careful management of the existing surface waters so the greatest use of their potential can be realized. (Robinson-ISWS)
W76-01318

METHODS AND DATA REQUIREMENTS FOR RIVER-QUALITY ASSESSMENT,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 5A.
W76-01334

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES,
Iowa Univ., Iowa City. Inst of Hydraulic Research.
For primary bibliographic entry see Field 6A.
W76-01338

LAND-CAPABILITY CLASSIFICATION OF THE LAKE TAHOE BASIN, CALIFORNIA-NEVADA, A GUIDE FOR PLANNING,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-01346

SPECIAL FLOOD HAZARD REPORT: CAMPBELL CREEK, GREATER ANCHORAGE AREA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-01361

FLOOD PLAIN INFORMATION: ALISO CREEK, ORANGE COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-01362

SPECIAL FLOOD HAZARD INFORMATION, BEAR AND EVANS CREEKS, REDMOND AND VICINITY, WASHINGTON.
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 4A.
W76-01363

FLOOD PLAIN INFORMATION: EIGHT MILE CREEK, VICINITY OF PARAGOULD, ARKANSAS.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W76-01364

FLOOD PLAIN INFORMATION: PART I - BAYOU BARTHOLOMEW AND TRIBUTARIES, CITY OF PINE BLUFF, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W76-01365

CIAL FLOOD HAZARD INFORMATION: LF LODGE CREEK AND TRIBUTARIES, INITY OF COUER D'ALENE, IDAHO.
y Engineer District, Seattle, Wash.
primary bibliographic entry see Field 4A.
-01367

OD PLAIN INFORMATION: POCOSHOCK POCOSHAM CREEKS, CITY OF HMOND AND CHESTERFIELD COUNTY, GINIA.
y Engineer District, Norfolk, Va.
primary bibliographic entry see Field 4A.
-01368

OD PLAIN INFORMATION: CASPER, OMING, VOLUME III, NORTH PLATTE ER.
y Engineer District, Omaha, Nebr.
primary bibliographic entry see Field 4A.
-01369

OD PLAIN INFORMATION: ST. JOE AND MARIES RIVERS, CITY OF ST. MARIES VICINITY, IDAHO.
y Engineer District, Seattle, Wash.
primary bibliographic entry see Field 4A.
-01370

CIAL FLOOD HAZARD REPORT: TO ISE FLOOD PLAIN INFORMATION, TROPOLITAN REGION, DENVER, LORADO; VOLUME II: SAND, TOLL GATE LOWER CHERRY CREEKS, SOUTH TTE RIVER BASIN.
y Engineer District, Omaho, Nebr.
primary bibliographic entry see Field 4A.
-01371

OD PLAIN INFORMATION: PROCTORS EK, CHESTERFIELD COUNTY, VIR-IA.
y Engineer District, Norfolk, Va.
primary bibliographic entry see Field 4A.
-01372

OD PLAIN INFORMATION: SAN ENZO RIVER, BOULDER CREEK-FEL-, SANTA CRUZ COUNTY, CALIFORNIA.
y Engineer District, San Francisco, Calif.
primary bibliographic entry see Field 4A.
-01373

OD PLAIN INFORMATION: APTOS, UT AND VALENCIA CREEKS, CITY OF OS, CALIFORNIA.
y Engineer District, San Francisco, Calif.
primary bibliographic entry see Field 4A.
-01374

ROGRAPH SYNTHESIS USING MATHE-ICAL MODELS,
ongong Univ. Coll. (Australia). Dept. of Civil neering.
primary bibliographic entry see Field 2A.
-01418

EVALUATION OF THREE RAINFALL-RU-F MODELS,
ash Univ., Clayton (Australia). Dept. of Civil neering.
primary bibliographic entry see Field 2A.
-01419

PROBLEMS IN THE PROGRAMMED OPTIMISATION OF A HYDROLOGICAL CATCHMENT MODEL,
Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 2A.
W76-01420

SIMULATION OF THE RAINFALL-RUNOFF PROCESS USING A HYSTERETIC INFILTRATION-REDISTRIBUTION MODEL,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-01421

FLOOD FREQUENCY DISTRIBUTION IN A CATCHMENT SUBJECT TO TWO RAINFALL PRODUCING MECHANISMS,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch.
For primary bibliographic entry see Field 2A.
W76-01425

WATER POLLUTION MONITORING SYSTEM, (IN JAPANESE),
For primary bibliographic entry see Field 5A.
W76-01443

SAM: A SEWER SYSTEM MODEL FOR PUBLIC WORKS ENGINEERS,
CH2M/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 5D.
W76-01463

GEOMORPHOLOGY OF A GLACIATED FIRST-ORDER VALLEY IN SOUTH CENTRAL NEW YORK,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W76-01469

COASTAL UPWELLING EXPERIMENT - I AND II, SURFACE HYDROGRAPHIC FIELDS DATA REPORT,
Ronsenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 2L.
W76-01496

8. ENGINEERING WORKS

8A. Structures

ENGINEERING THE BEAR SWAMP PROJECT,
Main (Charles T.) Inc., Boston, Mass.
For primary bibliographic entry see Field 6A.
W76-01010

INSERTION OF POLYETHYLENE PIPE RENEWS DAMAGED SEWER,
Montgomery Water and Sanitary Sewer Board, Ala.
N. P. Wiley.
Public Works, Vol. 104, No. 2, p 64-65, February, 1973. 5 fig.

Descriptors: *Plastic pipes, *Sewers, Plastics, Concrete pipes, Damages, Costs, Repairing, Pipes.
Identifiers: Polyethylene pipe.

A 22-inch polyethylene pipe lining has been used to renew a 24-inch reinforced concrete gravity sewer main damaged by hydrogen sulfide. The damaged portion of the main extended 754 feet in a straight line and veered at a 45 degree angle for an additional 96 feet. Added to the cost and inconvenience of replacement were the factors of infiltration of storm water and exfiltration of sewage into the surrounding terrain. Since the flow rate of the mentioned polyethylene pipe was the same as that for the damaged sewer, the polyethylene lining developed by the Du Pont Company was used for repairs. The three pipe sections were pulled by a winch, operating through a manhole on the upgrade of the run, into position at a rate of 30 to 40 feet per minute. The house laterals were then connected to the plastic pipe by inserting 4-inch polyethylene pipe through the old concrete lines and making house connections into the repaired main through the use of remote connector fittings. The entire job afforded a savings of about $10,000. (Sandoski-FIRL)
W76-01050

PVC PIPE CUTS COLORADO DISTRICT'S FLOW COST,
North Table Mountain Water and Sanitation District, Colo.
For primary bibliographic entry see Field 8G.
W76-01063

TRICKLE IRRIGATION DESIGN PARAMETERS,
Utah State Univ., Logan. Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.
W76-01087

INVENTORY OF POTENTIAL AND EXISTING UPSTREAM RESERVOIR SITES, TAUNTON AND NARRAGANSETT BAY STUDY AREAS.
Soil Conservation Service, Amherst, Mass.
For primary bibliographic entry see Field 7C.
W76-01269

WATER RESOURCES ASPECTS OF THE PROPOSED PERKINS STATION NUCLEAR POWER PLANT.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Water Resources Planning Dept.
Technical Report No IV-21-C (N0 1), North Carolina Water Plan, Area Management Plans, The South Atlantic Gulf Region, Yadkin-Pee Dee River Basin, 1974. 69 p, 18 tab, 1 map, 10 plates, 21 ref.

Descriptors: *Nuclear powerplants, *Water resources, *North Carolina, Hydrologic aspects, Withdrawal, Consumptive use, Low flow, Downstream, Water quality, Streamflow, Water resources development, Management, Hydrology, Recycling, Analysis, Sites, Discharge(Water), Waste disposal, Industrial wastes, Effluents, Water pollution.
Identifiers: *Perkins Power Plant, *Yadkin River(NC), Water resources management, Downstream use, Alternative sites.

A study was conducted to evaluate the potential effects of Duke Power Company's proposed Perkins Nuclear Station on the Yadkin River in Davie County, North Carolina, and to investigate 14 alternate sites. Intensive hydrological studies were performed and effects on water quality were investigated. The Yadkin-Pee Dee River is a valuable natural resource in North Carolina, and is considered more important to future industrial development than any other stream in the state. The Yadkin River, particularly in the vicinity of the Yadkin College gage, is less affected by drought conditions than other large streams of North Carolina. It is a dynamic and dependable river which should have formed the backbone of future comprehensive water resources planning in the Piedmont Region. As proposed, the Perkins Nuclear Station would withdraw water from the Yadkin River when the flows were above 330

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cubic feet per second (cfs). Withdrawals would be in the range of 50-315 cfs. During more critical conditions about 110 cfs of the water withdrawn would be consumed by evaporation, reducing the total river flow about 50%. The study was directed toward determining what conditions should be placed on the operation of the Perkins Station in order to minimize its effects on the state's water resources and what suitable alternative sites may be available. (Roberts-ISWS)
W76-01274

THE HYDRAULIC CHARACTERISTICS OF PLASTIC LAND DRAINAGE PIPE,
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experimental Unit.
For primary bibliographic entry see Field 8G.
W76-01290

NEEDS AND PLANS IN THE DEVELOPMENT OF URBAN AND RURAL SEWER SYSTEMS (POTRZEBY I PLANY ROZBUDOWY SIECI KANALIZACYJNEI W MIASTACH I OSIEDLACH),
J. Klossowski.
Gaz, Woda i Technika Sanitarna, Vol 47, No 1, p 20-21, 1973. 4 tab.

Descriptors: *Planning, *Sewerage, Population, Pipelines, Water, Installation.
Identifiers: Poland.

The size and investments required for urban and rural sewer system installation and/or expansion in Poland have been announced after statistics of the 1965-1970 five-year plan were tabulated. Data for the 1975-1985 period in terms of sewer length per inhabitant as related to the size of the settlement population are projected. Investment requirements are broken down over three periods, including 1970-1975, 1976-1980, and 1981-1985, according to pipeline length requirements and pump over costs- about 10 percent of that for sewage network installation. Theoretically, sewage system planning and development constitutes an integral part of their housing development and the sewage system pipeline length should accomodate all who receive public water. (Sandoski-FIRL)
W76-01294

DEVELOPMENTS IN TRENCH-TYPE TUNNEL CONSTRUCTION,
Palmer and Baker Engineers, Inc., Mobile, Ala.
W. F. Palmer, and K. C. Roberts.
Journal of the Construction Division, American Society of Civil Engineers, Proceedings paper No 11183, Vol 101, No CO1, p 37-49, March 1975. 8 fig.

Descriptors: *Underwater, *Construction, *Tunneling, *Tunnels, *Excavation, History, Foundations.
Identifiers: *Trench-type tunnels.

The basic concept of the subaqueous trench-type tunnel dates back to antiquity. It is known that a tunnel of this type was constructed in Babylon in 2180-2160 B.C. The modern revival of this old idea dates from before 1854. A review is presented of the various methods of construction proposed in the years following, culminating in the construction of the first true trench-type tunnel, the Detroit River Tunnel of the Michigan Central Railroad (1906-1910). Construction of this tunnel and other early tunnels--i.e., the Posey Tube, Alameda (1926-1928), The Detroit-Windsor Tunnel (1928-1930), the Bankhead Tunnel, Mobile, Ala. (1939-1940), and the Maas River Tunnel (1938-1941)--is described in general terms. The inherent advantages of trench-type tunnels were demonstrated in these early works and led to the widespread use of this kind during the ensuing years. (Bell-Cornell)
W76-01337

ZUMBRO RIVER BASIN, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
Available from National Technical Information Service, Springfield, Va 22161 as EIS-MN-73-1524-F, $5.00 in paper copy, $2.25 in microfiche September 19, 1973. 87 p, 3 map.

Descriptors: *Channel improvement, *Levees, *Flood control, Turbidity, Birds, Mammals, Environmental effects, Fish, Channels, Flood plain insurance, Flood protection, Floods, Flood plains, Environment, Flood proofing, Reservoir storage, *Minnesota.
Identifiers: *Environmental Impact Statements, *Rochester(Minn)

The project entails approximately 10 linear miles of channel modification on the South Fork Zumbro River, Bear Creek, and Cascade Creek in Rochester, Minnesota, with supplementary levee and pump station construction, flood proofing of municipal buildings, and regulation of the remaining flood plain areas. The environmental impact of the flood control plan would most importantly result in flood protection for the residents of Rochester. The savings from flood damages balance against the disruption to the greenbelt corridors and loss of natural riverine habitat over a distance of 10 linear miles. A net loss to the aesthetics of the human environment is also likely to result. Other adverse environmental effects include turbidity of water during construction; disruption of community affairs; relocation of two residences and eight businesses; and disruption of riparian and aquatic ecosystems with reduction of bird, mammal, and fish populations attendant from loss of habitat. Alternatives include flood proofing of existing and new structures; flood warning systems; permanent evacuation; flood insurance; flood plain regulation; large reservoir storage; headwater reservoir storage and improved land management practices; channel improvements and levees; and considerations of these measures. Comments were received from the Environmental Protection Agency, Department of Interior, and the Sierra Club among other institutions. (Gagliardi-Florida)
W76-01411

BAYOU BODCAU AND TRIBUTARIES, ARKANSAS AND LOUISIANA ASSOCIATED WATER FEATURES, RED RIVER, BAYOU BODCAU, FLAT RIVER, RED ETC....(FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
Available from National Technical Information Service, Springfield, Va 22161 as EIS-LA-73-1764-F, $4.50 in paper copy, $2.25 in microfiche. November 8, 1973. 84 p, 5 fig, 6 tab.

Descriptors: *Flood control, *Flood protection, *Flood frequency, *Construction, Fish, Wildlife, Wildlife habitats, Habitats, Forestry, Flood plain zoning, Flood plain insurance, Arkansas, Louisiana.
Identifiers: *Environmental Impact Statements, *Bayou Bodcau(Ark-La).

The project provides for the construction of a comprehensive flood control plan in the Bayou Bodcau, Flat River, Red Chute Bayou, and Loggy Bayou Basin. The plan creates flood protection against a headwater flood having a frequency of occurrence of 25 years. Construction of the recommended features all require physical alteration to segments of various bodies and will impose changes in use on some land areas. There will be adverse effects on the fish, wildlife, and forestry resources because of actual construction of project features and a result of changes in land use in the area to be protected. Many structural and nonstructural alternatives were considered including dams and reservoirs, modification of the Bayou Bodcau Reservoir, flood plain zoning, flood plain insurance, and payment or evacuation. (Denvir-Florida)
W76-01412

SAINT FRANCIS BASIN PROJECT, ARKANSA AND MISSOURI, (ENVIRONMENTAL IMPAC STATEMENT).
Army Engineer District Memphis, Tenn
Available from the National Technical Informa tion Service, Springfield Va 221 as EIS MO-7 1946 F, $9.00 in paper copy $2.2[illegible] in microfich December 17, 1973. 266 p, 4 plta, 13 tab, 2 append

Descriptors *Environmental effects, *Flood rou ing, *Detention reservoirs *Missouri *Arkansa Reservoirs Reservoir construction, Flood co trol, Drainage, Levees, Flood protection Chec structures, Control structures, Multiple-purpo reservoirs, Water management(Applied Aesthetics, Natural resources, Recreation, Publ health, Agriculture, Fish, Water birds, Waterfow Wildlife habitats, Groundwater basins, Feder government.
Identifiers: *Environmental Impact Statement *Dam effects.

The project involves the completion of a reservo in the Ozark foothills in southeast Missouri an channel improvements, and control structures i the alluvial valley in southeast Missouri an northeastern Arkansas. Predominate portions t be affected are rural, agricultural areas in a fl basin which has experienced frequent floodin Projected impacts of the project involve a redu tion in the frequency and duration of flooding wi resultant economic growth, improvement of ou door recreation, reduction of health hazards, an mitigation of fish and wildlife losses. Adverse e vironmental effects include increases in strea turbidity, reduction in fishery values, impairme of aesthetics, disruption of the benthic commun ty, loss of wildlife and windscreens because o removal of vegetation, erosion, and potential po lution. Less feasible alternatives considered wer (1) additional reservoirs, (2) floodplain manag ment-zoning, (3) acquisition of flowage eas ments, (4) no action, and (5) discontinuance o maintenance. The present generation will sacrifi a variety of natural resources to gain long-ter agricultural uses. Changes in land use will no bring about permanently irreversible commitmen of the environmental resources, but the diversit of uses will be reduced. Comments generally ex pressed concern over loss of outdoor recreation and harm to wildlife. (Fernandez-Florida)
W76-01414

PREDICTION OF THE EFFECTS OF TH FLOODWATER OF THE OLONA RIVER I TICINO (PREVISIONI SUGLI EFFETTI DELL IMMISSIONS DELLE ACQUE DI PIENE DELL OLONA IN TICINO),
For primary bibliographic entry see Field 4A.
W76-01447

FORCE MAIN RUNS OBSTACLE COURSE.
For primary bibliographic entry see Field 5D.
W76-01455

ON THE MINIMUM SIZE OF NATURAL DRAFT DRY COOLING TOWERS FOR LARG POWER PLANTS,
Cornell Univ., Ithaca, N.Y. Energy Project.
F. K. Moore.
Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-227 81 $4.00 in paper copy, $2.25 in microfiche. Paper N 72-18, August 1972. 32 p, 6 fig, 2 tab, 8 ref. NS GI-34776.

Descriptors: *Cooling towers, *Engineering struc tures, *Powerplants, Electric powerplants, Hea transfer, Cooling, Evaporation, Water cooling Engineering, Reynolds number, Froude number Design standards.
Identifiers: *Natural draft cooling towers, Dr cooling towers, Minimum size.

nple scaling law was derived which relates shape, drag coefficient and performance for al-draft dry cooling towers. The tower was ed as a gasdynamic duct, and the flow was zed by a perturbation theory for small tem- ure differences and flow Mach numbers. For drag, temperature performance, and duct atio, height was inversely proportional to the e of flow area. Adapting standard heat- nger design relationships and postulating a olds' analogy connecting friction and heat er, drag and performance were related to other, and the gasdynamic scaling law. A unction' was found, which has a minimum at icular air exit temperature, for a given water mperature. Thus, technical requirements for um size were derived. Absence of water- esistance, full counterflow equivalence and um 'size function' helped to define this um. Open-ended possibilities are the reduc- f fruction factor, and especially, increase of e exchanger entrance area, which can fully reduce drag and hence improve draft. -ISWS)
01488

ING LAW FOR DRY COOLING TOWERS COMBINED MECHANICAL AND NATU- DRAFT,
ll Univ., Ithaca, N.Y. Energy Project.
Moore.
ble from the National Technical Informa- ervice, Springfield, Va 22161 as PB-227 814, n paper copy, $2.25 in microfiche. Paper No August 1972. 28 p, 1 fig, 2 ref. NSF GI-

ptors: *Cooling towers, *Engineering struc- *Powerplants, Electric powerplants, Heat er, Cooling, Engineering, Reynolds number, e number, Design standards.
iers: *Natural draft cooling towers, anical draft cooling towers.

ing the theme of an earlier report, the amic performance equation for large-scale oling towers was generalized to include nical draft was well as natural draft. A ice of four elements, heat-exchanger, fan, xchanger, and fan, were contemplated in the esult, which thus included both induced- nd forced-draft towers as special cases. The consisted of a zero-order formula suitable ling tower configurations, together with a correction terms of first order in tempera- e. These served both to evaluate the accu- f the zero-order formula, and to compare s which are nearly equivalent gasdynami- n particular, it was found that a forced-draft requires slightly less power than the cor- ding induced-draft tower. That is, the effect at exchanger on a downstream fan is much than that of a fan on a downstream heat ger. Fan power, in ratio to heat rejected, is lent to tower draft height, but may be sup- any duct area; thus, compact fans, or other sive devices, are gasdynamically feasible. SWS)
490

Hydraulics

GATION CHARACTERISTICS OF COR- TED PLASTIC TUBING,
ate Univ., Columbus.
mary bibliographic entry see Field 3F.
064

RHAMMER CONSIDERATIONS FOR PELINE IN IRRIGATION SYSTEMS,
-Teed-Products Corp., Valley Forge, Pa.
mary bibliographic entry see Field 3F.
066

TRICKLE IRRIGATION DESIGN PARAMETERS,
Utah State Univ., Logan. Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.
W76-01087

FLOATABLE BREAKWATER,
R. B. Fuller
U.S. Patent No 3,863,455, 3 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 931, No , p 73, February 4, 1975.

Descriptors: *Patents, *Breakwaters, *Shore protection, Ocean waves, Erosion, Beach erosion.
Identifiers: *Wave action.

A floatable breakwater comprises a flexible tubular element supported upon a number of water buoyant rings at the surface of the water so that the envelope can be filled with water. Both ends of the envelope are open and have drawstrings attached thereto which in turn are anchored to secure the breakwater in position. The envelope has sufficient flexibility to enable the rings to move with respect to each other in an accordian-like movement. The breakwater is positioned in the water with its longitudinal axis angularly dispused to the direction of the wave movement and floating at such a depth that the breakwater will be filled with water through its open ends so as to be extendable and contractable axially by the relative movement of the annular members within the envelope when the breakwater is acted upon by waves. (Sinha-OEIS)
W76-01130

PREDICTION OF FLOW DEVELOPMENT ON SPILLWAYS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
R. J. Keller, and A. K. Rastogi.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY9, Proceedings Paper No 11581, p 1171-1184, September 1975. 9 fig, 1 tab, 21 ref, 2 append.

Descriptors: *Spillways, *Numerical analysis, *Boundary layers, *Air entrainment, Open channel flow, Turbulence, Hydraulics, Hydraulic structures, Design, Design flow, Velocity, Flow resistance, Roughness(Hydraulic), Aeration, Mathematical models.

A mathematical model for the flow development upstream of the region of air entrainment on a spillway was developed. The model was based on numerical solutions of the time-averaged two-dimensional form of the Navier-Stokes equations. Predictions from the model of mean velocity distributions, boundary layer growth, and water surface profiles were compared with experimental data, both model and prototype. Excellent agreement was obtained. Furthermore, it was shown conclusively that self-aeration in a spillway flow commenced at the point where the bed induced turbulence reached the free surface. (Adams-ISWS)
W76-01255

CHARACTERISTICS OF A CIRCULAR JUMP IN A RADIAL WALL JET,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
A. Arbhabhirama, and W. C. Wan.
Journal of Hydraulic Research, Vol 13, No 3, p 239-262, 1975. 14 fig, 5 ref, 1 append.

Descriptors: *Jets, *Hydraulic jump, *Energy dissipation, *Boundary layers, *Supercritical flow, Theoretical analysis, Laboratory tests, Reynolds number, Froude number, Flow, Subcritical flow, Velocity, Turbulent flow, Mathematical studies.
Identifiers: *Radial wall jet, Circular hydraulic jump.

The flow resulting from an axisymmetric jet impinging on a smooth horizontal flat surface is called a radial wall jet. When supercritical radial flow changes to subcritical flow in this jet, a circular hydraulic jump is formed. This can be used as an energy dissipator. Expressions for the energy dissipation and location of the jump were derived for a steady, incompressible and uniform flow, neglecting friction forces on the boundaries and assuming hydrostatic pressure distributions. The experimental verification was done using diesel oil and nozzle diameters varying from 1 to 3.75 inches for the Reynolds number in the range of 10,000 to 80,000. The experimental results satisfactorily verified the theoretical characteristics of the radial wall jet and circular hydraulic jump. The boundary layer, which developed outward from the stagnation point of the jet, had important effects on the radial flow profile. (Singh-ISWS)
W76-01267

CONSTRUCTION OF A SPILL CHANNEL AND EXPERIMENTAL DETERMINATION OF SPILL SPREADING RATES OF FOUR NON-HAZARDOUS CHEMICALS ON WATER.
Lowell Technological Inst., Mass. Dept. of Mechanical Engineering.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 491, $4.50 in paper copy, $2.25 in microfiche. Report No DOT/TST-75-18, March 1974. 53 p, 32 fig, 18 ref. DOT-OS-30109.

Descriptors: *Oil spills, *Laboratory tests, *Open channels, Waves(Water), Steady flow, Velocity, Hydraulic models, Laboratory equipment, Instrumentation, Measurement, Photography, Path of pollutants, Data collections, Water pollution sources.
Identifiers: *Spill channels, Spreading rates, Soybean oil, Tetrahydronaphthalene, Dicotyl phthalate, 1-hexadence, Wave generator.

An experimental study of the spill spreading rates of various representative hazardous, nonmiscible liquids on water was reported. These liquids were soybean oil, tetrahydronaphthalene, dioctyl phthalate, and 1-hexadence. A 40-foot spill channel was constructed in which various wavelength and period waves could be generated. The spill fluids were released at several different steady, controlled rates upon the water surface, with and without waves present. The resultant spill was photographed using timed motion picture photography. The spill spreading rate was studied as a function of spill fluid viscosity and density, spill release rate, and water surface conditions. Non-generalized results suitable for spill spread rate prediction were given. Recommendations for additional study were listed. (Humphreys-ISWS)
W76-01320

TURBULENCE MEASUREMENT OF A FLOW WITH SUSPENDED SOLID PARTICLES,
Gifu Univ., (Japan). Dept. of Civil Engineering.
S. Komura, and M. Kubota.
Water Resources Bulletin, Vol 11, No 5, p 871-880, October 1975. 8 fig, 1 tab, 15 ref.

Descriptors: *Turbulence, *Turbulent flow, *Laboratory tests, *Suspended solids, Eddies, Flumes, Roughness(Hydraulic), Measurement, Anemometers, Instrumentation, Hydraulics, Sediments.
Identifiers: *Hot-film probe, Macroscale.

Data on turbulence properties of flow with suspended solid particles were collected, analyzed, and reported. The turbulence data were collected using a quartz-coated, wedge-shaped hot-film probe in a laboratory flume with Toyoura sands as the solid particles. Results of these experiments indicated that the relative intensity of turbulence near the flume bed was less with suspended solid particles than with no suspended solid particles. It was observed that the

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macroscale of eddy decreased as the mean cross-sectional suspended sediment increased, and the ratio of decreasing macroscale of eddy to increasing suspended sediment concentration was large. A relationship was also developed between relative sediment concentration and the relative intensity of turbulence. (Bhowmik-ISWS)
W76-01470

REGIME EQUATIONS AND TIDAL INLETS,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W76-01484

THE EFFECT OF BREAKER SHAPE ON IMPACT PRESSURES IN SURF,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2L.
W76-01499

8C. Hydraulic Machinery

AUTOMATED VALVES FOR SURFACE IRRIGATION PIPELINES,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 4A.
W76-01120

BARRON COUNTY'S TRIPLE-THREAT HYDRAULIC BACKHOE.
Public Works, Vol 104, No 4, p 95-96, April, 1973. 2 fig.

Descriptors: *Construction equipment, *Construction, Soils, Storm drains, Sewers.
Identifiers: Barron County(Wisconsin), Hydraulic backhoe.

A Drott Model 40YR Cruz-Air hydraulic backhoe, equipped with two interchangeable buckets, a 60-inch bucket, and a Drott 4-in-1 bucket reduced project costs, cut machine rental expenditures, and saved time on various assignments in Barron County, Wisconsin. The Cruz-Air is used in digging test holes for sand and gravel deposits as well as trenching, placing pipes, and backfilling on storm sewer tasks. It can dig and load back-run gravel and sand, lift and place pilings and timbers, and prepare final grades for curbs, gutters, or sidewalks with accuracy within 1/2 inch. This machine has replaced a tractor backhoe, a crawler crane, and a front-end loader. (Sandoski-FIRL)
W76-01291

SUBMERSIBLE LIFT STATIONS CUT PUMP MAINTENANCE COSTS.
Water and Sewage Works, Vol 122, No 8, p 64-65, August, 1975.

Descriptors: *Pumps, *Sewage treatment, *Sewerage, *Waste water treatment, *Maintenance costs, Operating costs, Monitoring, Control systems, Sewer systems, California.
Identifiers: *Submersible pumps, Foster City(Calif).

Of 34 lift stations handling sewage for Foster City, California, 24 have recently been converted to the submersible pump type. About ten years ago, when the first pumping stations were installed in the city, types of stations included wet well with shaft-driven pumps, wet well/dry well, pneumatic ejector, and submersible. Maintenance and repair costs were high, and the majority of the pumps were difficult to remove for inspection or service. Moisture seeping into motors was a main problem. Since the installation of new Flygt submersible pumps, maintenance costs have been lowered considerably. Well structures have been modified and precise records are being kept on all stations and pumps. Semi-annually, each pump is removed from service and inspected. The pumps are washed and sandblasted down to bare metal, then exterior surfaces are recoated with bitumastic epoxy. This coating is necessary each six months to protect against corrosion from the high salt content of the waste water. Each submersible lift station has two or three pumps, so that at least one is available when the other is removed for maintenance work. An automatic control system for the sewage handling equipment pinpoints conditions at each pumping station and warns when there is a high liquid level in any well. Emergency generators are also available in the case of power failure (Kramer-FIRL)
W76-01460

QUICK RELEASE SAFETY TRAP,
J. C. McIlroy.
United States Patent 3,908,208. Issued September 30, 1975. Official Gazette of the United States Patent Office, Vol 938, No 5, p 2010, September, 1975. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Pipes, *Construction materials, Plastic pipes, Equipment.

A quick release trap for connecting waste water return plumbing lines has been patented. An arcuately curved pipe bend portion is described, having a pair of upwardly opening leg portions, sized to receive a corresponding one of a pair of downwardly pointed pipes. Each leg portion has several segmented and frangible end portions. Each respective leg portion is attached to its opposed pipe by a pair of engageable clamps. A threaded fastener is used to tighten each clamp and secure the tight attachment. The bend portion and leg portions are constructed of a high density polyethylene substance; light is therefore admitted through their walls so that a visual inspection of the condition of the pipe bend is possible before removal for cleaning. Each leg portion is readily detachable from its opposed pipe, and a water hose or other cleaning instrument may be inserted to remove or dislodge clogging material from the bend portion. (Kramer-FIRL)
W76-01467

8D. Soil Mechanics

MECHANICAL SNAKE RIVER UNDISTURBED SOIL CORE SAMPLER,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 7B.
W76-01272

SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
Available from National Technical Information Service, Springfield, Va 22161 as EIS-CA-73-1046-F, $5.50 in paper copy, $2.25 in microfiche. November 1972. 118 p.

Descriptors: *Levees, *Erosion control, *Flood protection, *Bank protection, Flood plains, Vegetation, Reservoirs, Erosion, Floods, Fish, Reservoir storage, *California, Flood control, Environmental effects, Flooding wildlife, Berms, Recreation, Aesthetics.
Identifiers: *Environmental Impact Statements, *Collinsville(Calif), Chico(Calif).

The proposed project entails construction of levee protection and erosion control works along the Sacramento River and its tributaries from Collinsville to Chico, California. The project will safeguard extensive areas in the Sacramento River flood plain from potential widespread damage and loss of life due to flooding. Protection of the le will result in loss of riparian vegetation and sociated fish and wildlife, recreation and sc values. The maintenance practices will also re in removal of vegetation on a regular basis bank protection program and accompanying m tenance will prevent the continuing erosio levees and loss of riparian lands and vegeta The primary adverse environmental effect is loss of aesthetic, wildlife and other natural ri an values. Such values would ultimately be lo erosion if the project is not constructed. Alte tives considered include levee setbacks, rev levee encroachment standards, construction o ditional reservoir storages, construction of berms, further bank and berm protection, deferring or terminating the work. (Gagli Florida)
W76-01409

8E. Rock Mechanics and Geology

POSTDEPOSITIONAL INJECTIONS OF URA UM-RICH SOLUTIONS INTO EAST PACI RISE SEDIMENTS,
Rosenstiel School of Marine and Atmospl Science. Miami, Fla.
H. Rydell, T. Kraemer, K. Bostrom, and O. Joensuu.
Marine Geology, Vol 17, No 3, p 151-164, 1974, 2 fig, 4 tab, 41 ref.

Descriptors: *Analytical techniques, *Isotope dies, *Heavy metals, *Uranium, *Sedime *Radioisotopes, *Marine geology, *Sediments rates, Spectrometry, Solvent extractions, exchange, Electrodeposition, Volcanoes, Trac Identifiers: *Thorium, *East Pacific Ri *Sediment dating, *Marine sediments, *Al particle spectrometry.

An 8.5 meter long apparently undisturbed from a hilltop on the crest of the East Pacific has uranium and thorium isotope distributions are very unusual. The core is very poor in Tho 232, and rich in uranium, particularly at the centimeter level, where a value of about 150 p per million is reached. At the same depth Thorium 230XS reaches very large nega values. These facts could be accounted for if assumes that solutions rich in uranium and po thorium had been predepositionally injected the sediments about 90,000-110,000 years ago. top of the sediment received much of its ura from seawater, judging from the Ura 234:Uranium 238 ratio. Possibly carbonate solutions were the carriers of the injected u um. (Kemp-Vanderbilt)
W76-01098

GENERALIZED GEOLOGIC FRAMEWORK THE NATIONAL REACTOR TESTING S TION, IDAHO,
Geological Survey, Reston, Va.
R. L. Nace, P. T. Voegeli, J. R. Jones, and M. Deutsch.
Supt. of Documents, GPO, Wash. D. C. 2 Price $2.90. Professional Paper 725-B, 1975. 4 10 fig, 10 tab, 21 ref.

Descriptors: *Hydrogeology, *Engineering ge gy, *Geological surveys, *Nuclear react *Idaho, Planning, Construction, Geologic u Geologic formations, Stratigraphy, Sampl Core drilling, Core logging, Sedimentol Geology, Water supply, Groundwater, W disposal, Nuclear wastes.

The Geologic framework of the NRTS (Nati Reactor Testing Station), Idaho, controls amount and availability of the water supply, methods and efficiency of obtaining water, and behavior of waste materials that are disposed o the ground and beneath the land surface.

nework also affects the selection of construc- sites and the operation of reactors and other lities. Basalt of the Snake River Group of ternary age is exposed in about three-fourths he station area. The basalt, typically gray to k, blusih-black, brown and brick red, ranges n dense to porous and highly vesicular. It oc- s in relatively thin interlocking flows; most of flows are the relatively smooth ropy type oehoe), but a few flows are blocky basalt (aa). ailed factors of the geologic framework that ld directly influence site selection, engineering gn and construction, and operation of reactors e studied chiefly at specific localities on the ion. These factors included the behavior of h materials during drilling, the availability of materials for construction, and the stability of h materials in excavations--under stress and er a range in moisture conditions. The Snake er Plain, including the NRTS, is subject to oc- onal seismic tremors; the oldest recorded k occurred in 1884. (Woodard-USGS)
5-01191

NCIPLES OF DIMENSIONING THE SUP- RTING SYSTEM FOR THE 'NEW AUSTRI- TUNNELLING METHOD',
. Rabcewicz, and J. Golser.
er Power, Vol 25, No 3, p 88-93, March, 1973. , 28 ref.

criptors: *Tunneling, *Tunnel construction, k mechanics, Safety factors, Stress.
tifiers: Austria.

neling experience during the last ten years in tria has proved the advantage of the 'New trian tunneling method' (NATM) over other hods, particularly in unstable rock. NATM is d on the principle of taking utmost advantage he capacity of the rock to support itself, by fully and deliberately controlling the forces in readjustment process which takes place in the ounding rock after a cavity has been made, adapting the chosen support accordingly. erally two methods of support are carried out. first is a flexible outer arch designed to stabil- the structure accordingly, and consists of a metrically anchored rock arch with surface ection mostly by shotcrete, possibly rein- ed by additional ribs and closed by an invert. behavior of the protective support and the ounding rock during the readjustment process ntrolled by a sophisticated measuring system. second means of support is an inner arch con- ng of concrete, and is generally not carried out re the outer arch has reached equilibrium. Its is to establish or increase the safety factors as ssary. The carrying capacity of the outer arch be decided by the curve characteristic for any n type of rock and primary stress condition. At intersection between the radial stress and the ying capacity curve, equilibrium is reached for respective support resistance. It is a particular ure of the NATAM that the intersections al- s take place at the descending branch of the e. Should a stiffer type of support be chosen he outer arch, the intersection with the carry- apacity curve is bound to rise while the safety r simultaneously decreases. The minimum ying capacity of the inner arch is decided by mallest lining thickness that will allow suita- compaction of the concrete. Should a greater l stress be required, the thickness can be en according to required radial stress and the ired safety factor. Once the carrying capacity e outer arch has been established for certain dard section, the means of strengthening can hosen and computed accordingly. (Sandoski-
L)
-01281

8F. Concrete

INSTALLATION CHECKS ON 4-INCH (102 MM) CORRUGATED POLYETHYLENE DRAIN TUBING,
Soil Conservation Service, Upper Darby, Pa.
For primary bibliographic entry see Field 3F.
W76-01071

CHAMBER METHOD OF SUBSURFACE AND DRIP IRRIGATION,
Massachusetts Univ., Amherst. Dept. of Food and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-01076

INVESTIGATION OF POLYMER-IMPREGNATED CONCRETE PIPE,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
W. C. Cowan, and H. C. Riffle.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 083, $4.50 in paper copy, $2.25 in microfiche. Report REC-ERC-74-14, September 1974. 48 p, 25 fig, 27 tab.

Descriptors: *Concrete pipes, *Mechanical properties, *Concrete testing, *Polymers, Compressive strength, Tensile strength, Shear strength, Laboratory tests, On-site investigations, Precast concrete, Hydrostatic pressure, Concrete technology, Reinforcement, Drains, Sewers, Culverts, Pipes, Absorption, Durability, Reinforced concrete.
Identifiers: *Polymer concretes, Loading tests, Pipe tests, Steel fiber reinforced concrete.

The evaluation of structural and durability properties of polymer-impregnated concrete (PIC) pipe as compared with those of commercially manufactured concrete pipe was presented in three separate studies: (1) 4-inch-diameter concrete draintile, (2) 12- and 24-inch-diameter concrete sewer and culvert pipe, and (3) 36-inch-diameter concrete culvert pipe. Impregnation and polymerization of concrete pipe resulted in significant improvement in strength and durability. Polymer impregnation of concrete draintile increased the three-edge bearing strength from about 70 to 280% above that of the untreated pipe. The three-edge bearing strength of 12- and 24-inch unreinforced concrete sewer and culvert pipe was increased from about 110 to 150% by polymer impregnation. Unreinforced 36-inch-diameter PIC pipe exceeded the ASTM: C 76 requirements for ultimate three-edge bearing load by 50 to 90%. Polymer-impregnated 36-inch-diameter concrete pipe subjected to 5% sulfuric acid showed increases in resistance to sulfuric acid attack of from 2.8 to 7.8 times that of the untreated concrete pipe. (Sims-ISWS)
W76-01489

8G. Materials

SEWER IN FLOOD PLAIN MUST FIGHT INFILTRATION.
For primary bibliographic entry see Field 5D.
W76-01048

INSERTION OF POLYETHYLENE PIPE RENEWS DAMAGED SEWER,
Montgomery Water and Sanitary Sewer Board, Ala.
For primary bibliographic entry see Field 8A.
W76-01050

PVC PIPE CUTS COLORADO DISTRICT'S FLOW COST,
North Table Mountain Water and Sanitation District, Colo.
B. Byrne.
Water and Sewage Works, Vol 119, No 12, p 51, December, 1972. 2 fig.

Descriptors: *Plastic pipes, *Sewerage, Clay pipes, Colorado, Costs, Joints(Connections), Pipes.
Identifiers: Polyvinyl chloride, North Table Mountain Water and Sanitation District.

Polyvinyl chloride (PVC) pipe has been used to meet tight specifications for the North Table Mountain Water and Sanitation District's sewer system near Denver, Colorado. Replacing vitrified clay pipe specified for all sized below 10 inches, the PVC pipe, with a rubber ring joint seal, meets exacting specifications of 100 gallons per inch diameter per mile per day and should save the district considerable sewage treatment costs. 19,660 feet of 8-inch and 555 feet of 6-inch sizes of the tough, resilient, and high-impact PVC pipe have been installed. Installation of the lightweight, corrosion-resistant pipe was quick and easy especially in soil of a high water level area. (Sandoski-FIRL)
W76-01063

INVESTIGATIONS OF THE APAC WATER SEEPAGE BARRIER,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
R. K. Frobel.
Master of Science Thesis, 1975. 67 p, 6 tab, 19 fig, 2 append, 20 ref.

Descriptors: *Sealants, *Leakage, *Linings, *Water storage, *Protective coatings, Reservoirs, Canals, Watersheds(Basins), Canal seepage, Seepage, Watertight, Reservoir leakage, Coatings, Impervious membranes, Soil sealants, Waterproofing, Canal linings, Water yield improvement.
Identifiers: APAC method.

Three testing methods were utilized to evaluate the APAC (Asphalt-Plastic-Asphalt-Chip-Coated) method of lining canals, catchments, and reservoirs. The first method tested hydrostatic puncture resistance; the second determined slope stability; and the third tested the overlap seal strength of three available adhesives. In all three tests APAC met the desired standards for providing secure water storage and transportation. (McLachlan-Arizona)
W76-01115

THE HYDRAULIC CHARACTERISTICS OF PLASTIC LAND DRAINAGE PIPE,
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experimental Unit.
C. W. Dennis.
Proceedings of the Institution of Civil Engineers, Vol 55, Part 2, p 273-284, March, 1973. 11 fig, 2 tab, 17 ref.

Descriptors: *Plastic pipes, *Surface drainage, *Hydraulic design, Clay pipes, Laboratory tests, Construction materials.
Identifiers: United Kingdom.

Land drainage in the United Kingdom is conventionally carried out using short lengths of clayware pipe, water entry to the system being via the gap between individual pipes. Since 1965 plastic drain pipes, of both smooth and corrugated construction, have been gradually introduced, in which the water enters through holes or perforations in the pipe wall. Hydraulic design data for the new product was lacking because of the unusual types of roughness involved. Laboratory tests were carried out and plotted in the conventional form of friction factor against Reynold's number. These graphs give information on flow in the laminar region and on the different types of changes to transitional flow which may occur. More practically, the tests show that the pipes currently available can be divided into three broad catego-

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ries based on the type of roughnes,. (Sandoski-FIRL)
W76-01290

STEEL SELECTED FOR TIGHT EFFLUENT LINE,
Warren and Van Praag, Inc., Decatur, Ill.
A. A. Bensley.
Public Works, Vol 106, No 9, p 96-97, September, 1975. 3 fig.

Descriptors: *Activated sludge, *Construction materials, *Pipelines, *Steel pipes, Sewers, Effluents, Joints(Connections), Installation, Illinois.
Identifiers: Decatur(Ill).

For the connection of a proposed activated sludge treatment stage of the Decatur, Illinois, Sanitary District to aerated lagoons, an effluent pipelines of the best appropriate material had to be chosen. Specifications for the effluent conduit included: a requirement for large size (36, 48, and 72 inches in diameter) conduit to meet limited head loss conditions; internal pressure of one to two pounds per square inch; pipes to be laid in shallow excavations, then covered by earthen embankments to a depth of 3 to 4 feet; and service roadways at given locations. While reinforced concrete pipe was the initial choice for the line, Armco Welded-Seam Helcor Smooth-Flow sewer pipe was found to be a suitable and less costly alternative. The basic material is corrugated steel, zinc coated, and the coils of corrugated steel are helically wound to form round pipe of a consistent diameter. The pipe has an asphalt covered exterior; the interior corrugations are also asphalt covered to a one-eighth inch depth. A combination of bolted connecting bands and rubber O-ring gaskets called Hugger joints, are used to link abutting lengths. Tightness of the joints was field tested, ane air pressure held to within the required limits. Pipe installation operations involved several 20-foot lengths to be laid and bedded, followed by air pressure testing of their individual joints. (Kramer-FIRL)
W76-01459

SEWER INSERTION RENEWAL SAVES TOWN $2.5 MILLION,
R. Doan, Jr., and M. T. Broderick.
Public Works, Vol 106, No 9, p 72-74, September, 1975, 3 fig.

Descriptors: *Sewerage, *Repairing, *Plastic pipes, Sewers, Costs, Conveyance structures, Pipelines, Construction, Maintenance, Joints(Connection), New York.
Identifiers: Sewer pipe insertion, *Polyethylene pipes, Amherst(NY).

Amherst, New York, saved $2.5 million or almost 80% of the cost of conventional sewer renewal by inserting polyethylene pipe into their deteriorating collector. Thirty-six inch (OD) Series 80 'Aldyl' D polyethylene pipe was pulled through 48-in (ID) tile block collector. Application of the Manning flow formula proved that the smooth interior of the 32-in polyethylene pipe would offer little resistance to the flow. This reduced resistance to flow in the inserted pipe maintained the original flow capacity. Specifications for the insertion process included: descriptions for unloading and storing 90, 39-ft lengths of polyethylene pipe: construction of three inch shafts and two entry shafts; butt fusion of the polyethylene pipe; clearing the old pipe prior to insertion; the actual steps of the insertion; details of mechanical connections; directions for tapping the polyethylene pipe at the line's three manholes; provisions for assurance of flow in the parallel 8-in sanitary line; procedures and materials for grouting; and procedures and materials for laying concrete protection over mechanical connections. Each of these specifications is discussed. The process renewed 3400 feet of the sanitary collector, possibly the biggest sewer insertion renewal project ever attempted by a municipality. The success of the project prompted Amherst to commit municipal labor to massive insertion renewal of sewers throughout the town. (Orr-FIRL)
W76-01461

LONGEVITY OF SEWER GROUT UNDER SEVERE CONDITIONS,
Hollywood Utilities Dept., Fla.
T. P. Calhoun.
Public Works, Vol 106, No 10, p 80, October, 1975.

Descriptors: *Construction materials, *Analytical techniques, *Sewer systems, Joints(Connections), Pipelines, *Grouting.
Identifiers: Acrylamide.

The performance of an acrylamide-based grout for the repair of sewer joints, which has been used since 1960, was evaluated in Hollywood, Florida. Because the area is involved in large amounts of sewer maintenance and rehabilitation, it was felt important that a grouted joint that had been exposed to severe conditions for several years be examined for deterioration. An 8-inch transverse main that had been grouted six years previous to examination was chosen. The joint was located in a section where sandy soil is periodically subjected to salt water intrusion, fresh water flooding, and prolonged dry spells. The line carries both domestic sewage and industrial waste. Visual inspection of the gel showed no signs of physical deterioration. While the soil was above the water table, no signs of grout desiccation were found. The gel ring was cut and the inside showed a solid matrix of sand and gel all the way through the pipe. Samples bf gel were sent to be inspected in a laboratory that manufacture acrylamide-based grout. No indications of shrinkage or chemical degradation could be measured. Thus, the grouted joints appear to have a very long-term life expectancy and appropriations for further grouting have been approved. (Kramer-FIRL)
W76-01462

8H. Rapid Excavation

HOW TORONTO IS INSTALLING SEWERS WITHOUT DISTRUPTING TRAFFIC FLOW,
For primary bibliographic entry see Field 5D.
W76-01051

PRINCIPLES OF DIMENSIONING THE SUPPORTING SYSTEM FOR THE 'NEW AUSTRIAN TUNNELLING METHOD',
For primary bibliographic entry see Field 8E.
W76-01281

8I. Fisheries Engineering

AN EXPERIMENT IN THE MIXED CULTURE OF CHANNEL CATFISH AND LARGEMOUTH BASS,
Illinois State Natural History Survey, Urbana.
D. H. Buck, R. J. Baur, and C. R. Rose.
Prog Fish-Cult. Vol 35, No 1, p 19-21. 1973. Illus.

Descriptors: *Bass, *Channel Catfish, Fish Management.

Consideration is given to the practicability for the combined culture of largemouth bass (Micropterus salmoides) and channel catfish (Ictalurus punctatus) in subadult sizes. Bass trained to accept pelleted food were stocked both alone and in combination with channel catfish in outdoor, unshaded, 10-foot-diameter plastic pools having soil substrates. Over a 70-day feeding period the catfish made the better gains, but the 2 species appeared to be completely compatible with neither limiting the production of the other.--Copyright (c) 1973, Biological Abstracts, Inc.
W76-01016

A REPORT ON THE ARTIFICIAL FERTILI TION OF THE SMALLMOUTH YELLOWFI BARBUS HOLUBI (STEINDACHNER, 1894),
Provincial Fish Inst., Lydenburg (South Afr Transvaal Nature Conservancy Div.
P. F. S. Mulder, and G. W. Franke
J Fish Biol. Vol 5, No 2, p 143-145, 1973

Descriptors: *Fertilization, Incubation, Mortal Identifiers: Barbus Holubi, Yellowfish

Artificial fertilization was successfully applie the culture of B. holubi. By this method the tilization potential was raised considerably and mortality rate under normal conditions during incubation period was less than 5%. The hand and transferring of larvae to fertilized rea ponds was simplified and an estimation of seasonal production could be made without w ing for the fish to attain the fingerling stage. N mal breeding activities were not disturbed frequent handling and natural breeding took p in ponds where the fish were kept.--Copyr 1973, Biological Abstracts, Inc.
W76-01021

TOTAL ALKALINITY AND HARDNESS SURFACE WATERS IN ALABAMA AND M SISSIPPI,
Auburn Univ., Ala. Dept. of Fisheries and Al Aquacultures.
For primary bibliographic entry see Field 2K.
W76-01144

THE EFFECT OF DURATION OF FEEDI AMOUNT OF FOOD, LIGHT INTENSITY, A ANIMAL SIZE ON RATE OF INGESTION PELLETED FOOD BY JUVENILE PENA SHRIMP,
Skidaway Inst. of Oceanography, Savannah, G
L. V. Sick, D. White, and G. Baptist.
Prog Fish-Cult Vol 35, No 1, p 22-26. 1973 Illus

Descriptors: *Shrimp, Fish diets, Fish physiol

Rates of pelleted formula diet ingestion (mg f ingested/g animal dry weight/hr) were determi for different size juvenile shrimp (Pena setiferus) (2-4 g, 5-7 g, and 15-20 g) fed at 10 and 30% of their total biomass, for feeding per of 6, 12 and 24 hr and under light intensities of 250 and 1100 ft-c. These interactions, tested u two 3 x 3 x 3 factorially designed random complete block experiments, revealed that highest average rate of ingestion (5.9) occu among animals fed 10% of their total bion under 1100 ft-c of light and exposed to the s food for only 6 hr. Comparing animal size, ligh tensity, and period of exposure to the same f revealed that rates of ingestion increased with creases in light intensity, decreased with an size (on a unit weight basis), and decreased with increase in period of exposure to the same food a 2nd experiment comparing animal size, ligh tensity, and amount of food, rates of food gestion for differences in animal size and ligh tensity were the same as in experiment 1. Inges rates did not change with increases in amount food fed above 10% of total biomass.--Copyr 1973, Biological Abstracts, Inc.
W76-01154

GEOGRAPHY AND LAKE MORPHOMET OF THE AQUACULTURE STUDY AREAIN T ERICKSON-ELPHINSTONE DISTRICT SOUTHWESTERN MANITOBA,
Fisheries and Marine Service, Ottawa (Ontario
For primary bibliographic entry see Field 2H.
W76-01166

EXPERIMENTALLY INCREASED FISH STO IN THE POND TYPE LAKE WARNIAK.

UMBERS AND BIOMASS OF THE FAUNA AS-
OCIATED WITH MACROPHYTES,
olish Academy of Sciences, Warsaw. Dept. of
ydrobiology.
or primary bibliographic entry see Field 2H.
76-01174

CHTHYOPHTHIRIASIS IN THE MIRROR
ARP: II. LEUKOCYTE RESPONSE,
gricultural Research Organization, Dor (Israel).
ish and Aquaculture Station.
. S. Hines, and D. T. Spira.
Fish Biol, Vol 5, No 4, p 527-524, 1973. Illus.

escriptors: *Carp, *Fish diseases.
dentifiers: Ichthyophthiriasis, Ichthyophthirius
ultifilis.

hanges in leukocyte counts in mirror carp in-
cted with Ichthyophthirius multifiliis were
corded during the disease. Leukocytes were
assified according to their appearance and stage
development. The overall white blood cell count
infected carp remained within the range found
normal carp under similar conditions. The 1st
cognizable event in leukocyte dynamics was a
arp but temporary drop in lymphocytes with a
ncurrent rise in neutrophil percentages early in
e infection. A similar trend also appeared
wards the end of the infection. A significant shift
wards younger cell populations was evident
nong the neutrophils. Blast cells with morpholog-
al characteristics of neutrophils appear in the cir-
lation. The percentage of these cells and of
her blast cells rose progressively during the in-
ction. The number of cells termed fine reticular
lls, also rose during infection. White blood cell
anges in the Nirror carp infected with I. mul-
iliis were similar to changes observed for other
seases and also in response to certain stress con-
tions.--Copyright 1974, Biological Abstracts,
c.
76-01410

0. SCIENTIFIC AND TECHNICAL INFORMATION

0D. Specialized Information Center Services

LECTED URBAN STORM WATER RUNOFF
STRACTS: JULY 1971 - JUNE 1972,
A. Sandoski.
nvironmental Protection Technology Series
PA-R2-72-127, December, 1972. 97 p, 215 ref.

escriptors: *Abstracts, *Urban runoff, *Storm
noff, Sewers, Design criteria, Construction
terials, Infiltration, Water pollution, Water
ality, Legislation, Tunnels.
entifiers: Treatment methods.

is compilation of abstracts summarizes articles
m a variety of technical literature and con-
ences, both domestic and foreign and published
m July 1971 through June 1972, primarily re-
ed to the problems of urban runoff caused by
rm water discharges, combined sewer over-
ws, and nonsewered urban runoff. All aspects
ated to this topic fall under the selective areas
design criteria and construction materials for
wers or apparatus employed in the flow of com-
ed sewage and/or storm runoff; regulation
vices for overflow or infiltration from urban ru-
ff of storm water, combined sewage, or
hway-salt runoff which can cause water pollu-
n; water quality, legislation, or treatment
thods based on problems caused from storm
ter; and, current tunnel technology and equip-
nt used in the construction of sewer tunnels.
e 215 abstracts covering a range of ten sections
arranged numerically by abstract accession
mber within each category. Each item includes a
liographic citation, an abstract, and a set of in-
dexing descriptors and identifiers. A subject index appended in this issue provides the necessary access to individual concepts. An author index and a glossary for journal abbreviations are also included. (Sandoski-FIRL) (See also W71-06253-W71-06255)
W76-01059

10F. Preparation Of Reviews

AGRICULTURAL WASTES, (LITERATURE REVIEW),
Mississippi State Univ., State College.
For primary bibliographic entry see Field 05D.
W76-01390

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SUBJECT INDEX

nteraction of Calcium and 2,4-D on Eurasian Watermilfoil,
V76-01141 4A

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BRITISH COLUMBIA UNIV., VANCOUVER. WESTWATER RESEARCH CENTRE.
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BROOKHAVEN NATIONAL LAB., UPTON, N. Y. BIOLOGY DEPT.
Experimental Eutrophication of Terrestrial and Aquatic Ecosystems. First Annual Report of the Upland Recharge Project,
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Raindrop-Size Distributions in the Melbourne Area,
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BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.
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Water Reuse: A Flexible and Efficient Management Alternative for Municipal Water Supply,
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The Role of the Academic in Water Resources Policy-Making: The Tijuana River, A Case Study,
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CANADA CENTRE FOR REMOTE SENSING, OTTAWA (ONTARIO). DATA ACQUISITION DIV.
Airborne Detection and Mapping of Oil Spi Grand Bahamas, February 1973,
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CANTERBURY UNIV., CHRISTCHURCH (NE ZEALAND), DEPT. OF CIVIL ENGINEERING
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Water Quality Baseline Assessment for Cleveland Area - Lake Erie, Volume I - Synthesis,
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Removal of Dissolved Molybdenum from Wastewaters by Precipitates of Ferric Iron,
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DEFENCE RESEARCH BOARD, OTTAWA (ONTARIO).
The Regime of the Ward Hunt Ice Shelf and of the Ice in the Mouth of Nansen Sound, Ellesmere Island,
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Biogeochemistry of Marsh Gases: Effects of Inorganic Constituents of Marsh Plants on Methane Evolution; and Carbohydrate Stability in Plants,
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Effects of Agriculture on Erosion and Sedimentation in the Piedmont Province, Maryland,
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Steady Infiltration From Line Sources Buried in Soil,
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Flood of June 1972 in the Southern Peace (Smoky River) Basin, Alberta,
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User Response to Water Quality and Water-based Recreation in the Qu'Appelle Valley, Saskatchewan,
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DU PONT DE NEMOURS (E. I.) AND CO., WILMINGTON, DEL. (ASSIGNEE).
Waste Water Treatment Process,
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Design of Long Interceptor Sewers,
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A Hydrophobic Membrane Probe for Total Pressure and Partial Pressure Measurements in the Soil Atmosphere,
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ENIVRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. EFFLUENT GUIDELINES DIV.
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Textile Mills Point Source Category,
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ENVIRONMENTAL PROTECTION AGENCY, ATLANTA, GA. REGION IV.
Ocean Outfalls and Other Methods of Treated Waste-Water Disposal in Southeast Florida, (Environmental Impact Statement).
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ENVIRONMENTAL PROTECTION AGENCY, SAN FRANCISCO, CALIF. REGION IX.
Industry Waste Study. The Hawaii Sugar Industry Waste Study.
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ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. EFFLUENT GUELINES DIV.
Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Steel Making Segment of the Iron and Steel Manufacturing Point Source Category,
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Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Petroleum Refining Point Source Category,
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Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Tire and Synthetic Segment of the Rubber Processing Point Source Category,
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Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Smelting and Slag Processing Segments of the Ferroalloy Manufacturing Point Source Category,.
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Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Synthetic Resins Segment of the Plastics and Synthetic Materials Manufacturing Point Source Category,
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FISHERIES AND MARINE SERVICE, OTTAWA (ONTARIO).
Geography and Lake Morphometry of the Aquaculture Study Areain the Erickson-Elphinstone District of Southwestern Manitoba,
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FISHERIES AND MARINE SERVICES, ST. JOHN'S (NEWFOUNDLAND). BIOLOGICAL STATION.
Limited Arsenic Dispersion in Sea Water, Sediments, and Biota Near a Continuous Source,
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FOREST SERVICE (USDA), OGDEN, UTAH. INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Land-Capability Classification of the Lake Tahoe Basin, California-Nevada, A Guide for Planning,
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Hydrologic Data for Little Elm Creek, Trinity River Basin, Texas, 1973,
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Geohydrology and Water Quality of the Mississippi River Alluvial Aquifer, Northeastern Louisiana,
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Hydrogeology Along the Proposed Barrier-Recharge-Well Alinement in Southern Nassau County, Long Island, New York,
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Floods in Eastern Lajas Valley and the Lower Rio Loco Basin, Southwestern Puerto Rico,
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Floods in the Carolina-Rio Grande Area, Northeastern Puerto Rico,
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Methods and Data Requirements for River-Quality Assessment,
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GEOLOGICAL SURVEY, PORTLAND, OREG. WATER RESOURCES DIV.
Formulation and Use of Practical Models for River Quality Assessment,
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GEOLOGICAL SURVEY, RALEIGH, N.C.
Environmental Hazards of Large Scale Water Developments,
W76-01348 6G

GEOLOGICAL SURVEY, RESTON, VA.
Quality of Surface Waters of the United States, 1969: Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins.
W76-01176 2K

Surface Supply of the United States, 1966-70: Part 3. Ohio River Basin--Volume 3. Ohio River Basin from Louisville, Kentucky, to Wabash River.
W76-01177 2E

Surface Water Supply of the United States, 1966-70: Part 1.' North Atlantic Slope Basins--Volume 1. Basins from Maine to Connecticut.
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Galerkin Finite-Element Simulation of a Geothermal Reservoir,
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Generalized Geologic Framework of the National Reactor Testing Station, Idaho,
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GEORGETOWN UNIV., WASHINGTON, D.C. DEPT. OF ECONOMICS.
The Integrated Multi-Media Pollution Model,
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GHENT RIJKSUNIVERSITEIT (BELGIUM). LABORATORIUM VOOR ANORGANICHE TECHNISCHE CHEMIE, ELEKTROTERMIE EN ELEKTROCHEMIE.
The Elimination of Phosphates and Nitrates of Waste Water by Algae Cultures: I (/n Flemish),
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GIFU UNIV., (JAPAN). DEPT. OF CIVIL ENGINEERING.
Turbulence Measurement of a Flow with Suspended Solid Particles,
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Basics of Pollution Control.
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HAWAII UNIV., HONOLULU. DEPT. OF AGRICULTURAL ENGINEERING.
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Longevity of Sewer Grout Under Severe Conditions,
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HOUSTON UNIV., HOUSTON, TEX.
An Integrated Power Process Model of Water Use and Wastewater Treatment in Ammonia Production,
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Analysis of Aragonite from the Cuttlebone of Sepia Officinalis L.,
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Henderson County Surface Water Resources,
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ILLINOIS STATE NATURAL HISTORY SURVEY, URBANA.
An Experiment in the Mixed Culture of Channel Catfish and Largemouth Bass,
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Chemistry of Mun-Water Interface in an Impoundment,
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ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.
Removal of Pesticides by Reverse Osmosis,
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Field Performance of Selected Beef Feedlot Waste Handling Systems,
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INDIANA STATE DEPT. OF NATURAL RESOURCES, BLOOMINGTON.
Sedimentation in Lake Lemon, Monroe County, Indiana,
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INSTITUTE FOR AGRICULTURAL RESEARCH, ZARIA (NIGERIA).
The Hydrology of a Small Catchment Basin at Samaru, Nigeria: I. Seasonal Fluctuations in the Height of the Ground Water Table,
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INSTYTUT PRZYRODNICZYCH PODSTAW, LUBLIN (POLAND). PRODUKEJI ROSLINNEJ RA.
Preliminary Investigations on Mutual Growth Relations of the Populations of the Blue-Green Alga Microcystis Aeruginosa and Green Algae Monoraphidium Minutum and Scenedesmus Abundans in Bicultures,
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Soil Water Depletion by Lodgepole Pine on Glacial Till,
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Computer Assisted Procedures in Water Project Evaluation,
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INTERNATIONAL JOINT COMMISSION-UNITED STATES AND CANADA. GREAT LAKES LEVELS BOARD.
Regulation of Great Lakes Water Levels, A Summary Report, 1974.
W76-01395 4A

IOWA STATE UNIV., AMES. DEPT. OF AGRICULTURAL ENGINEERING.
Nitrate, Phosphorus, and Sulfate in Subsurface Drainage Water,
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IOWA STATE UNIV., AMES. DEPT. OF ZOOLOGY AND ENTOMOLOGY.
Nutrients and Algae in Some Central Iowa Streams,
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Area Needed for Land Disposal of Beef and Swine Wastes,
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On the Depth of the Halocline in an Estuary,
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JUNTA DE ENERGIA NUCLEAR, MADRID (SPAIN). LABORATORIO DE RADIOECOLOGY.
Contribution to the Taxonomy and Ecology of Fresh-Water Mollusks in Streams of Central Spain, (In Spanish),
W76-01288 2I

KANSAS STATE UNIV., MANHATTAN. DEPT. OF AGRICULTURAL ENGINEERING.
Experience with a Spray-Runoff System for Treating Beef Cattle Feedlot Runoff.
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KARLSRUHE UNIV. (WEST GERMANY). INSTITUT FUER HYDROMECHANIK.
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KENTUCKY UNIV., LEXINGTON. DEPT. OF AGRICULTURAL ENGINEERING.
Upward Water Movement in Field Cores,
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Water Pollution from Agriculture,
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LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N. Y.; AND COLUMBIA UNIV., NEW YORK. DEPT. OF GEOLOGY.
Internal Wave Dispersion Calculated Using the Thomson-Haskell Method,
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- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
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- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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VOLUME 9, NUMBER 4
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

WATER CYCLE

.. General

NERALIZED CRITERIA FOR VERIFICA-ON OF WATER DEVELOPED THROUGH ATHER MODIFICATION,
tinger M. W. and Associates, Inc., Fort Collins, o.
r primary bibliographic entry see Field 3B.
6-01519

SCHEME FOR STOCHASTIC STATE VARIA-E WATER RESOURCES SYSTEMS OP-MIZATION,
nois Univ. at Urbana-Champaign. Dept. of Civil gineering.
r primary bibliographic entry see Field 2E.
76-01685

AYESIAN INFERENCE AND DECISION MAK-G FOR EXTREME HYDROLOGIC EVENTS,
ternational Inst. for Applied Systems Analysis, xenburg (Austria).
r primary bibliographic entry see Field 4A.
76-01761

ATHEMATICAL MODEL FOR ESTABLISH-G THE OVERFLOW SPILLWAY SCHARGES IN THE FLOOD STORAGE ONDS,
cademia de Studii Economics, Bucharest umania). Dept. of Economic Cybernetics.
or primary bibliographic entry see Field 4A.
76-01762

ONG-TERM FLOOD PREDICTION FROM HORT-TERM RIVER DATA.
or primary bibliographic entry see Field 4A.
76-01776

TORM RUNOFF IN THE VICINITY OF OAK IDGE, TENNESSEE,
ak Ridge National Lab., Tenn.
D. Sheppard.
vailable from the National Technical Informa-on Service, Springfield, Va 22161 as ORNL M4662, $4.00 in paper copy, $2.25 in microfiche. eport No. ORNL-TM-4662, October 1974. 24 p, 0 fig, 1 tab, 22 ref. ERDA W-7405-eng-26.

Descriptors: *Rainfall-runoff relationships, Storm runoff, Hydrology, *Streamflow, *Flow uration, *Frequency analysis, Rainfall, Runoff, Meteorological data, Probable maximum recipitation, *Tennessee.
dentifiers: *Oak Ridge(Tenn), *Rainfall frequen-y, Annual series, Exceedance series.

Rainfall in the vicinity of Oak Ridge, Tennessee, rom 1948 through 1971 was examined for periodic effects. Many hydrologic studies in the area by various agencies were summarized. Both annual maximum and exceedance series were used to analyze rainfall of various durations. It was shown hat a storm containing a 100-year long duration event will not necessarily contain a 100-year short duration event. Flow duration analysis using mean daily flows were presented for gaged catchments ranging in size from 0.38 to 82.5 sq mi. It was shown that the average response of streams in the area to storm conditions, as determined by daily flow duration curves, is linear with drainage area. (Terstriep-ISWS)
W76-01841

ROOT DEPTH AS A SENSITIVE PARAMETER IN A DETERMINISTIC HYDROLOGIC MODEL,
Agricultural Research Service, Beltsville Md. Hydrograph Lab.; and Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
For primary bibliographic entry see Field 2I.
W76-01846

2B. Precipitation

ON TH VARIABILITY OF 'DYNAMIC SEEDABILITY' AS A FUNCTION OF TIME AND LOCATION OVER SOUTH FLORIDA. PART II. TEMPORAL VARIABILITY,
National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
W. R. Cotton, and A. Boulanger.
Journal of Applied Meteorology, Vol 14, No 7, p 1376-1382, October 1975. 7 fig, 4 ref.

Descriptors: *Weather modification, *Cloud seeding, *Florida, Atmosphere, Sounding, Temperature, Humidity, Rainfall, Precipitation(Atmospheric), Artificial precipitation, Model studies, Mathematical models, Cloud physics, Meteorology.

Using the one-dimensional cumulus model developed by Cotton, predictions of the effects of seeding cumulus clouds were performed during the month of July 1973 as part of the Experimental Meteorology Laboratory's Florida Area Cumulus Experiment 1973 experiment. In Part I seedability predictions with the Miami 1200 GMT soundings were compared with soundings taken over the center of the experimental area (central site) at 1400 GMT. It was found that substantial differences between the two predictions occurred on a number of days in spite of the fact that the soundings were separated in time by only 2 h and in space by only 110 km. Here the seedability predictions with the MIA 1200 GMT soundings and the CS 1800 GMT soundings were compared. The CS 1800 GMT soundings were assumed to be representative of conditions over the experimental area during the period of operation of the experiment. It was found that the predictions with the MIA 1200 GMT soundings were, on the average, more representative of conditions over the center of the experimental area during the period of operation of the experiment than were the predictions with the CS 1400 GMT soundings. The results indicated that the choice of a sounding site and sounding time to be used for prediction of seeding effects over an experimental area must be carefully considered in the design of the experiment. (See also W75-12089) (Sims-ISWS)
W76-01529

WEATHER MODIFICATION OPERATIONS IN CALIFORNIA, OCTOBER 1, 1972 - SEPTEMBER 30, 1973,
California State Dept. of Water Resources, Sacramento, Div. of Planning.
For primary bibliographic entry see Field 3B.
W76-01530

THE CLIMATE OF CHIHUAHUA, MEXICO,
Texas Univ. at El Paso. Geological Sciences.
R. H. Schmidt, Jr.
The University of Arizona Institute of Atmospheric Physics, Technical Reports on the Meteorology and Climatology of Arid Regions, No 23, 1975, 50 p, 29 fig, 18 ref.

Descriptors: *Climatology, *Mexico, *Semiarid climates, *Precipitation(Atmospheric), Climates, Climatic data, Meteorology, Temperature, Topography, Weather, Weather data, Arid climates, Humid climates, Rainfall, Meteorological data, Altitude.
Identifiers: Chihuahua(Mexico).

The climatological data used in this study, which is derived from seven agencies in Chihuahua which operate a combined total of about 130 meteorological stations in the state, represent a relatively short record (10-15 years). The mean annual precipitation for the state is 409 mm, the average temperature is 16 C with record extremes of minus 30 C and 48 C. Most of the state's precipitation falls in the form of rain during brief summer thundershowers. A comparison between the mean and median indicates that annual temperatures are near stabilization and annual precipitation totals are not. The state's two major climatic groups are closely associated with the geomorphic units. The arid and semiarid zone of the state generally coincides with the Basin and Range, and the humid mesothermal climates are found in the Sierra Madre Occidental. (Robinett-Arizona)
W76-01703

SURFACE ALBEDO AND DESERTIFICATION,
Agricultural Research Service, Water Conservation Lab. Phoenix, Ariz.
R. D. Jackson, and S. B. Idso.
Science, Vol 189, p 1012-1013, September 19, 1975, 1 fig, 10 ref.

Descriptors: *Albedo, *Deserts, *Vegetation effects, *Soil surfaces, *Rainfall, Arid lands, Grazing, Vegetation, Soil-water-plant relationships, Soil physical properties, Temperature, Soil temperature.
Identifiers: *Surface albedo, *Desertification, Overgrazing.

Evidence is offered and a theory is presented for disclaiming the hypothesis by Otterman which states that when high-albedo soils are denuded (vegetation removed by overgrazing), the resultant increase in surface albedo causes lower surface temperatures, which in turn reduce the heat input to the lower atmosphere, decrease its temperature lapse rate, and hence somewhat reduce convective activity leading to rainfall. From results of experimentation, the authors predict that the denuded surface would be warmer than the vegetated one. It is believed that Otterman's assumed value of 0.9 for emissivity for both the bare and vegetated areas could have introduced temperature errors as great as 8 C. (Robinett-Arizona)
W76-01705

LONG-TERM STREAMFLOW RECORDS RECONSTRUCTED FROM TREE RINGS,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
C. W. Stockton.
Paper of the Laboratory of Tree-Ring Research No. 5, University of Arizona Press, Tucson, 1975. 111 p.

Descriptors: *Dendrochronology, *Streamflow, *Colorado River Basin, *Time series analysis, *Climatology, Rainfall, History, Trees, Average flow, Hydrology, Runoff, Streams, Streamflow forecasting, Colorado River, River basins, Hydrologic data, Droughts, Statistical methods, Frequency analysis, Precipitation(Atmospheric).
Identifiers: Tree rings, Bright Angel Creek Basin(Ariz), Hydrologic records, San Francisco River Basin(New Mexico), Lees Ferry(Ariz), Wet periods, Dendrohydrology, Streamflow record.

A study to investigate the use of tree-ring series for augmenting hydrologic records is described. Two watersheds, the Bright Angel Creek Basin in north-central Arizona and the San Francisco River Basin in west-central New Mexico, are studied and the knowledge gained then applied to the Upper Colorado River Basin. The subject of the investigation is the variablity in the response of the runoff to climatic parameters, and the corresponding response of the tree-ring series. Results indicate that the longterm mean runoff at Lees Ferry (a point just below the northern Arizona border on

the Colorado River) is about 13 million acre-ft. per year, the variance (in million acre-ft. squared) is 13.95, very serious droughts occurred during the periods 1565-1600 and 1870-1890, and the two extended periods of maximum runoff that occurred during the past 400 years were immediately preceded by a period of extended low runoff. (Robinett-Arizona)
W76-01708

HEAVY FALL AND WINTER RAIN IN THE CAROLINA MOUNTAINS,
National Weather Service, Garden City, N.Y. Eastern Region.
D. B. Gilhousen.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-74 11761, $3.50 in paper copy, $2.25 in microfiche. NOAA Technical Memorandum NWS ER-57, October 1974. 6 p, 3 fig, 1 ref.

Descriptors: *Excessive precipitation, *Rainfall, *Mountains, *North Carolina, *South Carolina, Floods, Winter, Autumn, Precipitable water, Air circulation, Atmosphere, Precipitation(Atmospheric), Weather patterns, Weather, Runoff forecasting, Meteorology.
Identifiers: *Carolina mountains.

There were eight known days in the period Ocotober 1, 1972 to March 31, 1973 in which more than two inches of rain occurred at any North or South Carolina Mountain Station. These cases were studied to see if common patterns could be identified to assist in recognizing the threat of heavy rain. The study focused on the 850, 500, 300 mb. analyses, precipitable water and stability charts available just prior to the onset of heavy rain. Also considered were the latest trajectory model forecasts that were available prior to the occurrence of heavy rain. Common characteristics were found in the synoptic scale patterns and trajectory model forecasts available prior to the onset of heavy rain. In the future, if these features are identified in the fall and winter months, the threat of locally heavy rain is established. The extent of over-warning, however, is not known since it was not determined how often these features occurred and heavy rain did not fall. (Sims-ISWS)
W76-01830

STORM RUNOFF IN THE VICINITY OF OAK RIDGE, TENNESSEE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2A.
W76-01841

FORMATION OF CLOUD AND ICE NUCLEI BY THE COMBUSTION OF CRUDE OIL,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lab.
C. C. Van Valin, R. F. Pueschel, and F. P. Parungo.
Journal of Applied Meteorology, Vol 14, No 6, p 1200-1203, September 1975. 2 fig, 1 tab, 11 ref.

Descriptors: *Nucleation, Oil wells, *Burning, Smoke, Oil, Chemistry, Aircraft, Sampling, Surveys, On-site investigations, Pollutants, Air pollution, Meteorology, *Pollutant identification, Cloud physics, Ice, *Wyoming.
Identifiers: *Oil well fires, *Glenrock(Wyo), Aitken nuclei concentrations, Ice nuclei concentrations, Plumes.

Aitken nuclei and ice nuclei concentrations in the smoke plume from an oil well fire at Glenrock, Wyoming, on Dec. 14, 1973 were found to be elevated by at least an order of magnitude as compared with the surrounding atmosphere. The composition of most particles in the plume was suggestive of the clay minerals; these could account for the increased ice nuclei concentrations. (Sims-ISWS)
W76-01857

A COMPARISON OF CANADIAN AND UNITED STATES STANDARD METHODS OF MEASURING PRECIPITATION,
Windsor Univ. (Ontario). Dept. of Geography.
M. Sanderson.
Journal of Applied Meteorology, Vol 14, No 6, p 1197-1199, September 1975. 2 fig, 2 tab, 6 ref.

Descriptors: *Precipitation(Atmospheric), *Measurement, *Rain gages, *Canada, *United States, Snowfall, Rainfall, Gages, Data collections, Methodology, Meteorology.
Identifiers: Comparison of methods.

Methods of measuring precipitation vary from country to country. Consequently, the comparability of precipitation data along international borders is questionable. Five years of precipitation data at Windsor, Ontario, using the standard Canadian and United States methods of measuring precipitation were compared. Monthly rain amounts were very similar, but substantial differences existed in snow measurement. The Canadian method appeared to overestimate precipitation from snowfall. (Sims-ISWS)
W76-01858

ESTIMATION OF THE DISRUPTIVE IMPACT OF SNOWFALLS IN URBAN AREAS,
Queensland Univ., Brisbane (Australia). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-01859

RADAR REFLECTIVITY FACTOR CALCULATIONS IN NUMERICAL CLOUD MODELS USING BULK PARAMETERIZATION OF PRECIPITATION,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
P. L. Smith, Jr., C. G. Myers, and H. D. Orville.
Journal of Applied Meteorology, Vol 14, No 6, p 1156-1165, September 1975. 8 fig, 18 ref. NSF GA-36910X, Bureau of Reclamation 14-06-D-6976.

Descriptors: *Radar, *Hail, *Model studies, Mathematical models, Computer models, Precipitation(Atmospheric), Remote sensing, Rain, Raindrops, Size, Storms, Thunderstorms, Meteorology.
Identifiers: *Radar reflectivity factor, Numerical cloud models, Hail size distribution.

Various methods for calculating radar reflectivity factors in numerical cloud models that use bulk methods to characterize the precipitation processes were described and compared. Equations sensitive to changes in the parameters of the particle size distributions were favored because they allow simulation of phenomena causing such changes. Marshall-Palmer-type functions were established to represent hailstone size distributions because the previously available distributions lead to implausibly large reflectivity factors. Simplified equations were developed for calculating reflectivity factors for both dry and wet hail. Some examples were given of the use of the various equations in numerical cloud models. (Sims-ISWS)
W76-01860

2C. Snow, Ice, and Frost

OPERATIONAL SYSTEMS FOR SNOW REMOVAL AND ICE CONTROL: A BACKGROUND/RESOURCE PAPER FOR THE UPPER GREAT LAKES UNIVERSITY CONSORTIUM FOR TRANSPORTATION RESEARCH,
Michigan Technological Univ., Houghton, Mich.
For primary bibliographic entry see Field 4A.
W76-01591

PREVENTION OF FRAZIL ICE CLOGGING OF WATER INTAKES BY APPLICATION OF HEAT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W76-01832

A FRAZIL ICE CONCENTRATION MEASURING SYSTEM USING A LASER DOPPLER VELOCIMETER,
Bendix Corp., Davenport, Iowa. Instruments and Life Support Div.
C. C. Schmidt, and J. R. Glover.
Journal of Hydraulic Research, Vol 13, No 3, p 299-314, 1975. 5 fig, 6 ref. NSF GK35918X1.

Descriptors: *Frazil ice, *Instrumentation, *Laboratory equipment, *Electronics, Ice, Velocity, Measurement, Temperature, Data collections.
Identifiers: *Laser Doppler Velocimeter, Ice particles, Concentration, Icing, Optical scattering.

A laboratory instrument to measure frazil ice was developed by designing special electronics to process the signal produced by a commercial Laser Doppler Velocimeter. The system performance was evaluated by comparing experimental measurements with theoretical results. The upper concentration that could be measured was not determined. The system limitations were discussed. The instrument was calibrated to provide measurements of flow velocity and frazil ice concentration without flow disturbance and icing problems. (Adams-ISWS)
W76-01850

A COMPARISON OF CANADIAN AND UNITED STATES STANDARD METHODS OF MEASURING PRECIPITATION,
Windsor Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W76-01858

ESTIMATION OF THE DISRUPTIVE IMPACT OF SNOWFALLS IN URBAN AREAS,
Queensland Univ., Brisbane (Australia). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-01859

2D. Evaporation and Transpiration

SOYBEAN AND CORN ROOTING IN SOUTHWESTERN MINNESOTA: II. ROOT DISTRIBUTIONS AND RELATED WATER INFLOW,
Agricultural Research Service, Pendleton, Oreg.
R. R. Allmaras, W. W. Nelson, and W. B. Voorhees.
Soil Science Society of America Proceedings, Vol 39, No 4, p 771-777, July-August 1975. 3 fig, 8 tab, 30 ref.

Descriptors: *Root systems, *Corn(Field), *Soybeans, *Absorption, *Inflow, *Minnesota, Soil water movement, On-site investigations, Soil properties, Hydraulic conductivity, Plant growth, Moisture stress, Plant populations, Root development, Harvesting, Crop production, Soil-water-plant relationships, Depth, Mathematical models, Regression analysis, Resistance.
Identifiers: *Root length density, *Specific water inflow, Determinate isoline, Indeterminate isoline.

Root length density (RLD) of corn and two isolines (determinate and indeterminate) of Harosoy soybean in a Nicollet soil were measured from July 1 to August 15, 1971. Both soybean isolines had about 0.2 cm/cu cm RLD in the Ap layer with values less than 0.1 below the Ap layer. The RLD distribution persisted with depth as

system expanded vertically. Corn RLD were
t 0.3 initially in the Ap layer, and as the root
em expanded vertically, maximum RLD of
t 0.3 was produced even to the 100-cm depth
ugust 9. Vertical extension rates of corn after
1 were 1.3 cm/day as compared with 1.7 for
eans, but maximum rooting depths on August
ere 145 and 120 cm, respectively. Modal
ific water inflows were 0.03 cu cm/cm root per
Maximal values for soybeans were 0.2; max-
values for corn were about 0.05. Maximum
ean rooting depths coincided with maximum
h of water uptake sink, but corn rooting
hs ranged 15 to 30 cm deeper than the water
ke sink. Specific water inflow generally in-
sed as soil hydraulic conductivity increased
RLD decreased, which agrees with models for
dy-state water flow into single roots. At low
, specific water inflows were either constant
ncreased as hydraulic conductivity decreased.
ocky-ISWS)
6-01528

NAL EVAPORATION DETERMINED BY ERMAL MODELING,
logical Survey, Bay Saint Louis, Miss.
E. Jobson.
rint from Proceedings of the Symposium on deling Techniques held at San Francisco Calif, tember 3-5, 1975: American Society of Civil gineers, p 729-743, 1975. 5 fig, 17 ref, 2 append.

scriptors: *Model studies, *Evaporation, rface waters, *Water temperatures, Canals, ite element analysis, Analytical techniques, uations, Winds, Channel morphology, Heat nsfer, Correlation analysis, Forecasting, alifornia.
ntifiers: *San Diego Aqueduct(Calif).

e thermal balance of the 26-kilometer San Diego ueduct in southern California was studied to ermine the manner in which the surface change varies with meteorologic factors. teorologic and hydraulic variables, as well as water temperature at each end of the canal, re continuously monitored. Data were analyzed the Eulerian framework by use of a one-dimen-nal, finite-difference model. Field measure-nts indicated the water temperature was well xed in the cross section. The model predicts the mperature at the downstream end of the canal as unction of time. Analyzing 12 days of data, the ass-transfer coefficient in the Dalton-type aporation equation was varied by trial and error til the predicted and measured downstream tem-ratures most nearly agreed in the least-squares nse. The root-mean-square error of the pre-cted temperature was quite sensitive to the ass-transfer coefficient. Another finite-dif-rence model was constructed which allows the ta to be analyzed in the Lagrangian framework. his model allows the construction of a graph of e Dalton wind function versus windspeed. ithin the range of 0.5 to 4 meters per second the ind function appeared to vary linearly with wind-eed. The mass-transfer coefficient developed r lakes provides a reasonable approximation of e wind function provided the short effective tch of a stream is properly accounted for. Woodard-USGS)
76-01582

VAPOTRANSPIRATION OF DRYLAND BAR-EY WITH DIFFERENT PLANT SPACING PAT-ERNS,
alifornia Univ., Riverside.
. E. Luebs, A. E. Laag, and P. A. Nash.
gronomy Journal, Vol 67, No 3, p 339-342, May-une, 1975. 1 fig, 3 tab, 6 ref.

escriptors: *Evapotranspiration, *Crop produc-on, *Crop response, *Planting management, Barley, Drought resistance, Growth stages, Plant rowth, Water requirements, Water utilization, ysimeters, Soil moisture, Transpiration, Plant physiology, Soil-water-plant relationships, Moisture stress, Canopy.
Identifiers: *Plant spacing patterns, Hordeum vulgare L., Leaf area index, Row spacing.

Results are reported of an experiment which was conducted during the 1969-70 growing season near Riverside, California, to study the effect of plant spacing patterns of dryland barley (Hordeum vulgare L.) on leaf area index, crop canopy, evapotranspiration, and yield. The minimum unit area of equal plant population density for all spacing patterns was 240 sq cm. Crop canopy and leaf area index were lowest for the grid spacing pattern (8.3-cm row spacing with seeds spaced 7.4 cm in the row) largely because of less tillering. The paired-row pattern (8.1 cm spacing between rows in a pair and 24.3 cm between pairs with seeds spaced 3.7 cm in the row) had highest leaf area index but intermediate crop canopy during the vegetative phase with adequate water. Slightly greater evapotranspiration values were found during the first two-thirds of the growing season for the standard row pattern (16.3-cm row spacing with plants spaced 3.7 cm in the row) which resulted in greater water stress and lower evapotranspiration values later in the season, but grain yield was not affected. (Robinett-Arizona)
W76-01697

ESTIMATING EVAPOTRANSPIRATION UNDER NONHOMOGENEOUS FIELD CONDITIONS,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
L. H. Parmele, and E. L. Jacoby, Jr.
NE-51, April, 1975. 61 p, 8 fig, 4 tab, 32 ref, 4 append.

Descriptors: *Evapotranspiration, *Topography, *Micrometeorology, *Energy budget, Ohio, Small watersheds, Slopes, Microclimatology, Lysimeters, Evaporation, Soil moisture, Transpiration, Water loss, Estimating equations, Meteorology.
Identifiers: *Rolling topography, North Appalachian Experimental Watershed(Coshocton Ohio), Bowen ratio, Evapotranspiration estimation, Roughness length parameter.

This study was conducted on a watershed with a slope of 13 percent, consisting of rolling-surface topography, located in the North Appalachian Experimental Watershed, Coshocton, Ohio. Detailed micrometeorological measurements were made during selected days throughout 1969 using a lysimeter in order to test the application of commonly used meteorological methods of estimating evapotranspiration under conditions of rolling terrain. The Bowen ratio energy budget method proved superior to the stability-adjusted aerodynamic methods in comparing hourly lysimeter flux rates. Computations agreed with the lysimeter for bare soil and for corn 75 cm high. However, for corn higher than 75 cm, the roughness length parameter was adjusted to an unusually low value of 1.0 cm in order to best fit the combination equation. Methods are presented for making probable-error analysis of evapotranspiration estimates through meteorological methods. (Robinett-Arizona)
W76-01707

WATER BALANCE STUDIES,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria). Div. of Atomic Energy in Food and Agriculture.
For primary bibliographic entry see Field 3F.
W76-01882

WATER REQUIREMENTS OF CROPS,
Soil Inst., Tehran (Iran).
For primary bibliographic entry see Field 3F.
W76-01884

2E. Streamflow and Runoff

RELATIONSHIPS OF LOW, AVERAGE AND FLOOD FLOWS FOR STREAMS IN THE PACIFIC NORTHWEST,
Washington State Univ., Dept. of Civil and Environmental Engineering. Pullman.
J. F. Orsborn, F. D. Deane, M. T. Arce, and J. P. Ahlers.
Available from the National Technical Information Service Springfield, Va 22161 as PB247-103, $4.50 in paper copy, $2.25 in microfiche. Completion Report, June 30, 1975. 61 p, 20 fig, 5 tab, 24 ref, 2 append. OWRT A-074-WASH(1). 14-31-0001-5048.

Descriptors: Hydrologic data, *Streamflow, *Floods, *Low flow, *Average flow, *Pacific Northwest U.S.
Identifiers: Average, *Flow correlations, Ungaged streamflow.

Research conducted on the water resources of six State Water Program study areas for the Washington Department of Ecology has exposed numerous opportunities for improving methods of hydrologic analysis for ungaged streams. Gaged streamflow characteristics within hydrologic provinces display relationships with respect to particular physical parameters of their drainage basins. Floods are more difficult to correlate with basin parameters than are low flows. But, low, average annual, and flood flows can be related with each other for basins within hydrologic provinces. The low flow of an ungaged stream is determined using the basin-geomorphic parameter method. The average annual flow is estimated from a plot of average annual precipitation and drainage area for gaging stations in the province. By knowing both the low and average annual flows, two-year and 50-year flood flows can be quickly determined. Many options for determining ungaged streamflows are opened by having these correlations of low, average, and flood flows available. Results of a research project on the relationships between low, average, and flood flows for selected stream gaging stations in the Pacific Northwest are presented. (Bechard-Washington State)
W76-01507

HYDROLOGIC UNIT MAP--1974, STATE OF WISCONSIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01571

HYDROLOGIC UNIT MAP--1974, STATE OF HAWAII.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01572

HYDROLOGIC UNIT MAP--1974, STATE OF GEORGIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01573

HYDROLOGIC UNIT MAP--1974, STATE OF ILLINOIS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-01574

SUMMARY OF FLOODS IN THE UNITED STATES DURING 1969,
Geological Survey, Reston, Va.
J. K. Reid.
Available from Superintendent of Documents, GPO, Washington, DC 20402, price $1.90. Water-Supply Paper 2030, 1975. 173 p, 57 fig, 44 tab, 41 ref.

Descriptors: *Floods, *United States, *Flood data, *Flood damage, Hydrologic data, Streamflow, Peak discharge, Flood flow, Storms, Hurricanes, Tidal effects, Flood stages.
Identifiers: *Floods(USA-1969).

The most outstanding floods in the United States during 1969 are described in chronological order. The areas most seriously affected by flooding were: Central and southern California (January and February); the upper Midwestern States of North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, and Illinois (April); north-central Ohio (July); Mississippi, Alabama, and Virginia (Hurricane Camille in August); and Florida and Georgia (September). Hurricane Camille was the most intense hurricane on record to enter the United States mainland. It struck the Mississippi-Alabama coast on August 18, with tidal waves as high as 25 feet above mean sea level and wind velocities more than 190 miles per hour. Tidal wave and flood damage was about $1.3 billion. In Mississippi the known dead totaled 139 and 76 other persons were missing. The hurricane caused record-breaking floods of streams also in a 50-mile-wide area from Sulphur Springs, W. Va., to Fredericksburg, Va. Total flood damage in Virginia exceeded $116 million. There were 113 known deaths, 102 injuries, and 39 people missing. (Woodward-USGS)
W76-01576

GENERAL MODEL TO SIMULATE FLOW IN BRANCHED ESTUARIES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W76-01580

MAP SHOWING FLOOD OF APRIL 1975 AT MERIDIAN TOWNSHIP, MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-01584

GEOLOGIC CONTROL OF SUPPLY AND QUALITY OF WATER IN THE MOUNTAINOUS PART OF JEFFERSON COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-01585

THE RIVER'S REACH: AN ASSESSMENT OF EXISTING FLOOD PROTECTION IN UPSTREAM WATERSHEDS OF THE CONNECTICUT RIVER BASIN.
Soil Conservation Service, Durham, N.H.
For primary bibliographic entry see Field 4A.
W76-01592

A SCHEME FOR STOCHASTIC STATE VARIABLE WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
V. T. Chow, D. H. Kim, D. R. Maidment, and A. T. Ula.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 299, $5.50 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana. Research Report No 105, October 1975, 102 p, 18 fig, 6 tab, 71 ref, append. OWRT B-084-ILL (2) 14-31-0001-4080

Descriptors: *Dynamic programming, *Optimization, *Systems analysis, *Model studies, Streamflow, Synthetic hydrology, *Stochastic processes.

The development of an analytical scheme for the formulation and optimization of water resources systems is described. The scheme being proposed and investigated is to model the stochastic input of annual as well as monthly streamflows to a hydrologic and water resources system, to formulate the system in a state variable format, and to optimize the stochastic state variable model so formualted by dynamic programming. For annual streamflows, a second-order autoregressive model with a data-based transformation is proposed, and both the maximum likelihood method and the Bayesian approach are used for estimating the model parameters. For monthly streamflows, two linear models are proposed, one is the regression model and the other is the functional relationship model, and their consideration of both uncorrelated and correlated errors and their techniques of generation by a stationary Markov process are discussed. The proposed state variable approach provides a generalized framework within which many different kinds of system models may be expressed and combined for the representation of a given hydrologic and water resources system. This simple yet general format is a major advantage of the proposed state variable modeling. While the annual or monthly streamflows are generated as stochastic inputs to the state variable system model by the proposed scheme, a new procedure of optimization of the system by stochastic dynamic programming is developed. Although the research effort should be further extended to the development of practical procedures for application, a few simple examples are given to illustrate the validity of such applications.
W76-01685

LONG-TERM STREAMFLOW RECORDS RECONSTRUCTED FROM TREE RINGS,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
For primary bibliographic entry see Field 2B.
W76-01708

LONG-TERM FLOOD PREDICTION FROM SHORT-TERM RIVER DATA.
For primary bibliographic entry see Field 4A.
W76-01776

2F. Groundwater

HYDROGEOLOGY OF GLACIAL DEPOSITS IN TIPPECANOE COUNTY, INDIANA, SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING WATER RESOURCES IN MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
A. M. S. Marrouf, and N. Melhorn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 093, $6.00 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 61, June, 1975. 107 p, 26 fig, 9 tab, 50 ref, append. OWRT C-3277(No 3713) (7).

Descriptors: *Groundwater Resources, *Groundwater basins, *Glacial aquifers, *Aquifer management, Geohydrology, Glacial drift, Outwash, Pleistocene epoch, Groundwater, Water sources, Groundwater availability, Water supply, Perched water, Hydrologic budget, Underground streams, Water storage, *Indiana.
Identifiers: Illinoian glacier, Wisconsin glacier, Teays River Channel, glacial Lake, Lafayette, Wabash River drainage, Tippecanoe County(Ind).

The unconsolidated glacial deposits of Tippecanoe County average about 200 feet in thickness. Analysis of subsurface data indicates that the pre-Pleistocene drainage system does not coincide with the present drainage network. The most significant aquifers occur in the glacial drifts. Illinoian age outwash deposits are the most extensive and most highly developed aquifers, but pre-Illinoian and Wisconsin outwash aquifers are also extensive and have not been significantly utilized. In this report, the distribution of aquifers are mapped and their lithologic, stratigraphic, and hydrogeologic aspects analyzed. Most water wells in the county are less than 200 feet and yield from 5 to 2000 GPM. The present total pumpage is about 35 MGPD, and there is no apparent long-term continuous decline in water level. Future development of groundwater resources in the Lafayette Urban Area is most favorable in unexploited areas of thick sand and gravel aquifers which occupy the Teays, Anderson, Clarks Hill and other pre-glacial valleys in bedrock. Limited geochemical data suggest that there is no significant deterioration of water quality. Future land use planning should recognize the location of the most promising aquifers to protect the groundwater reserves.
W76-01521

UNIQUENESS OF A MODEL OF STEADY STATE GROUND-WATER FLOW,
Nevada Univ., Reno. Desert Research Inst.
R. L. Cooley, and P. J. Sinclair.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 097, $4.00 in paper copy, $2.25 in microfiche. Water Resources Research Center, Reno Hydrology and Water Resources Publication No 22, August 1975. 39 p, 6 fig, 9 tab, 17 ref. OWRT A-054-NEV (1) 14-31-0001-4028.

Descriptors: *Aquifer characteristics, Hydrologic budget, Mathematical models, *Base flow, *Groundwater movement, Model studies, *Nevada.
Identifiers: *Truckee Meadows(Nev).

The main objective was to investigate the conditions necessary to determine bounds on values of the hydrogeologic parameters which characterize a model of steady-state, areal, near surface ground-water flow. A second objective was to develop a quantitative characterization of the ground-water flow system in Truckee Meadows, Nevada. An inverse method of determining the parameters was employed allowing the parameters to be calculated from the known hydraulic head distribution. Results showed that data collection and use of a reliable inverse method are complementary. Early application of an inverse method to a study would indicate areas where data are contradictory or inadequate and where the gathering of additional critically placed data should (if possible) continue until there is no material change in results of the model. At this point, provided the model is theoretically adequate, the data can be sufficient. (Fallon-Nevada)
W76-01526

GEOLOGIC CONTROL OF SUPPLY AND QUALITY OF WATER IN THE MOUNTAINOUS PART OF JEFFERSON COUNTY, COLORADO
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-01585

GROUND WATER IN SELECTED AREAS IN THE KLAMATH BASIN, OREGON,
Geological Survey, Portland, Oreg.
A. R. Leonard, and A. B. Harris.
Oregon State Engineer, Salem, Ground Water Report No 21, November 1974. 104 p, 14 fig, 5 plates, 10 tab, 12 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Oregon, Water wells, Well data, Water yield, Groundwater recharge, Water level fluctuations, Chemical analysis, Water supply.
Identifiers: *Klamath basin(Oreg).

Groundwater features of six lowland areas in the Klamath Basin of Oregon--Klamath Marsh area and Sprague River, Swan Lake, Yonna, Poe, and Langell Valleys--are described. Rugged mountains and ridges surround and separate these lowlands where floors range in altitude from 4,100 feet

Valley to 4,600 feet north of Klamath Marsh. six areas extend over a north-south distance miles, an east-west distance of 40 miles, and de an area of approximately 600 square miles. area is semiarid and received about 14 to 18 es of precipitation a year. Extinct volcanoes their extrusions characterize the area. Most tap permeable basalt or cindery rubble ath the lacustrine beds. The depths of wells e from less than 50 to nearly 2,000 feet--most between 100 and 1,000 feet deep. Flowing occur in all areas except Swan Lake Valley. most extensive area of flowing wells is in the gue River valley, where about 25 wells, some ing more than 2,000 gpm, supply water for ir- ion. Water levels in wells fluctuate seasonally 1 to 4 feet. Groundwater in the basin is of ex- nt quality for drinking, irrigation, and most in- rial uses. (Woodard-USGS)
-01590

EVEL SUBSURFACE DRAINAGE ORY,
h Dakota State Univ., Brookings. Dept. of cultural Engineering.
. DeBoer, and S. T. Chu.
sactions of the American Society of Agricul- Engineers, Vol 18, No 4, p 664-667, July-Au- 1975. 4 fig, 6 ref.

criptors: *Subsurface drainage, *Equations, dy flow, Unsteady flow, Water table, Dupuit- hheimer theory, Drainage systems, Depth, Ir- ion, Economics, Elevation, Height, Percola- Hydraulic gradient, Velocity, Hydraulic con- ivity.
tifiers: *Bilevel drainage, Analytical solu- , Drain line depth, Drain line spacing, Stream-

analytical solutions were derived for a bi- subsurface drainage situation where drain are located at two depths on an alternating s. The first solution described the steady state ation, while the second was applicable to the ng water table situation. Both solutions were d on the validity of the Dupuit-Forchheimer mptions. The derived solutions have not been fied by independent data. These solutions uld be applicable for the design of bi-level nage systems and for the design of remedial nage measures when an existing drainage em is underdesigned. (Vixocky-ISWS)
5-01847

. Water In Soils

UID CHROMATOGRAPHIC ANALYSES IN L CHEMISTRY,
consin Univ., Madison. Water Resources ter.
primary bibliographic entry see Field 5A.
-01636

ER CHROMATOGRAPHIC ANALYSIS IN L CHEMISTRY,
consin Univ., Madison. Water Resources ter.
primary bibliographic entry see Field 5A.
-01638

PERSION AS AN INDEX OF RELATIVE DRAULIC CONDUCTIVITY IN SALT-AF- TED SOILS OF THE SUDAN,
rtoum Univ., Khartoum (Sudan). Dept. of chemistry and Soil Science.
. Hamid, and M. A. Mustafa.
derma, Vol 14, No 2, p 107-114, August, 1975. , 1 tab, 16 ref.

criptors: *Hydraulic conductivity, spersion, *Soil dispersants, *Saline soils, *Soil mistry, Infiltration, Percolation, Permeability, Pores, Africa, Salts, Land reclamation, Salinity, Arid lands, Soil types, Electrolytes, Soil chemical properties, Soil management, Alkalinity, Irrigation water, Irrigation effects, Water quality.
Identifiers: Dispersion index, Exchangeable sodium percentage, *Electrolyte concentration, *Sudan, Aridisols, Vertisols.

Experimentation on two samples selected from an Aridisol and a Vertisol showed that relative hydraulic conductivity increased whereas dispersion index decreased as exchangeable sodium percentage decreased and electrolyte concentration increased. The dispersion index was found to account for over 80 percent of the variability of relative hydraulic conductivity of a salt affected sample and could thus be used to predict relative hydraulic conductivity. For tentative use of the presented prediction procedure, a dispersion index of 13 for similar Aridisols and 8 for Vertisols could be used as a guide, suggesting the need for improving irrigation water quality. In addition, the validity of this prediction procedure still remains to be tested on soils in situ before it can be established as a field practice. (Robinett-Arizona)
W76-01694

FATE OF NITROGEN IN SEWAGE EFFLUENT APPLIED TO SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5B.
W76-01696

DETECTION OF SOIL MOISTURE BY REMOTE SURVEILLANCE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, R. D. Jackson, and R. J. Reginato.
American Scientists, Vol 63, No 5, p 549-557, September-October, 1975. 3 fig, 64 ref.

Descriptors: *Remote sensing, *Soil moisture, *Moisture content, *Electromagnetic waves, *Radiation, Wind erosion, Evapotranspiration, Soil management, Soil-water-plant relationships, Albedo, Water utilization, Infrared radiation, Microwaves, Planting management, Crop production, Agriculture, Insect control, Plant physiology, Plant viruses, Plant diseases, Soil erosion, Hydrologic budget.
Identifiers: Short-wave radiation.

An attempt is made to show how soil moisture data acquired by remote sensing from aircraft or satellites may be used to improve human life. Three general regions of the electromagnetic spectrum are being used today in feasibility studies of remote sensing of soil moisture: the visible, or short-wave region; the thermal, or long-wave region; and the radar, or microwave region. One of the primary benefits of remote detection of soil moisture would be prediction of agricultural production. Knowledge of soil-water content can also greatly assist man in coping with the various insect pests that regularly ravage farmlands, and can aid in the prediction of plant disease (water content is one of the most important aspects of the soil environment influencing the growth and survival and soil-borne plant pathogens). Other applications of soil moisture prediction include use in making crop planting decisions, in determining soil erosion probability, and in problems associated with solving the water balance equation for river basins. (Robinett-Arizona)
W76-01706

A FIELD STUDY ON THE RELATIONSHIP OF TEMPERATURE AND ICE TO INFILTRATION AT A SPRAY IRRIGATION FACILITY,
Michigan State Univ., East Lansing. Dept. of Civil and Sanitary Engineering.
T. S. Vinson, and B. E. Davidson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 516, $5.50 in paper copy, $2.25 in microfiche. Completion Report Institute of Water Research, Michigan State University, November 1975. 121 p, 57 fig, 6 tab, 48 ref, 2 append. OWRT A-079-MICH(1). 14-31-0001-3522.

Descriptors: *Land application of wastewater, *Wastewater management, *Reclamation, Hydrologic cycle, Spray irrigation, Evapotranspiration, Temperature control, Infiltration, Frozen soils.
Identifiers: *Water quality management project, Infiltration, Water movement in frozen soil.

Data on air, surface and ground temperatures, and infiltration were collected from three sites at a spray irrigation area during the first winter spray program. Two contiguous sites received six spray applications during the winter months. A third site was used as a control site and received no spray application. Soil temperatures were monitored at each site using thermistors at depths of 0.0 ft., 0.25 ft., 0.5 ft., 1.0 ft., 3.0 ft., and 10.0 ft. A continuous temperature recorder was used to measure ambient air temperatures. Natural precipitation was recorded by a 'weighing bucket' types rain guage. Spray application was measured by nonweighing rain gauges. Infiltration was monitored by three lysimeters at depths of approximately 1.0 ft., 3.0 ft., and 5.0 ft. at each site.
W76-01810

RESPONSE OF SATURATED SANDS TO CYCLIC SHEAR AT EARTHQUAKE AMPLITUDES,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 8D.
W76-01814

DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING THERMAL INFRARED IMAGERY,
Alabama Univ., Huntsville. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-01840

ROOT DEPTH AS A SENSITIVE PARAMETER IN A DETERMINISTIC HYDROLOGIC MODEL,
Agricultural Research Service, Beltsville Md. Hydrograph Lab.; and Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
For primary bibliographic entry see Field 2I.
W76-01846

BI-LEVEL SUBSURFACE DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W76-01847

A WATERSHED SOILS INDEX OF RUNOFF POTENTIAL,
Agricultural Research Service, Coshocton, Ohio.
J. L. McGuinnes, and W. A. Edwards.
Journal of Soil and Water Conservation, Vol 30, No 4, p 184-186, July-August 1975. 3 fig, 1 tab, 7 ref.

Descriptors: *Runoff, *Soil classification, *Indexing, *Soil properties, *Soil science, *Soil types, *Infiltration, *Hydrology, *Permeability, Soil groups, Storm runoff, Infiltration rates, Hydrologic systems, Agricultural runoff, Drainage.
Identifiers: *Runoff potential, *Coshocton(Ohio), *Soils index, Drainage class, Hydrologic response unit.

A method was presented for the systematic classification of runoff potential of soils. The classification was accomplished by means of a soils index. The index was composed of drainage classes ranging from excessively to very poorly drained, and permeability classes ranging from very rapid to very slow. Seven steps were defined in each class. It was demonstrated that good correlation exists between the soil index described and dormant season runoff for ten Coshocton watersheds. The relationship appeared to be independent of soil cover. All of the watersheds were on a corn-wheat-meadow-meadow rotation, and for a given dormant season, cover varied from a scanty wheat cover to heavy second year meadow. (Terstriep-ISWS)
W76-01848

PHYSICAL INTERPRETATION OF THE DIFFUSION EQUATION PARAMETERS ACCORDING TO MARKOV'S STOCHASTIC PROCESSES THEORY,
Louvain Univ. (Belgium). Dept. de Genie Rural.
C. Laroussi, and L. De Backer.
Soil Science, Vol 120, No 3, p 169-173, September 1975. 2 fig, 7 ref.

Descriptors: *Diffusion, *Unsaturated flow, *Porous media, *Markov processes, *Darcys law, Continuity equation, Diffusivity, Boundary processes, Fluid mechanics, Analytical techniques, Flow.
Identifiers: *Diffusivity coefficient, Moisture profiles.

This study dealt with the derivation of the diffusion equation by considering the displacement of a fluid particle through an unsaturated porous medium as a Markov's stochastic process. The comparison of this equation with that obtained from the combination of Darcy's generalized equation and the equation of continuity allowed assessment of the physical significance of the diffusivity coefficient as well as its partial derivative. The diffusivity coefficient represents the ease with which the fluid particles spread from a zone of high fluid content and it is essentially a function of flow conditions. The physical interpretation of these parameters may be related to the boundary conditions of the flow phenomenon and can help in determining the field of application and the validity limits of the diffusion theory. (Singh-ISWS)
W76-01851

A NOTE ON THE MOISTURE DIFFUSIVITY OF SATURATED SWELLING SYSTEMS FROM DESORPTION EXPERIMENTS,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology and Climatology.
J. Y. Parlange.
Soil Science, Vol 120, No 2, p 156-158, August 1975. 1 fig, 10 ref.

Descriptors: *Soil water movement, *Saturated soils, *Sorption, *Diffusivity, *Mathematical studies, Soils, Soil water, Soil moisture, Soil properties, Moisture, Moisture uptake, Optimization, Infiltration rates, Moisture availability.
Identifiers: *Moisture diffusivity, *Swelling soils, *Nonswelling soils, *Desorption experiments, Sorptivity.

Relations between sorptivity and diffusivity derived for nonswelling materials have been applied recently to swelling materials. It was shown that such applications are invalid and that relations that are specific to swelling materials must be used. A possible relation between sorptivity and diffusivity for swelling materials was proposed for the case of desorption. The results were used to reinterpret experimental observations. (Prickett-ISWS)
W76-01852

EFFECT OF ABRUPT TEXTURAL CHANGE ON POTENTIAL PROFILES DURING STEADY-STATE INFILTRATION,
Iran Plan Organization, Tehran.
M. Bybordi.
Soil Science, Vol 120, No 2, p 92-95, August 1975. 4 fig, 11 ref.

Descriptors: *Soil water movement, *Infiltration, *Soil properties, *Potential flow, *Soil moisture, Water table, Mathematical studies, Analytical techniques, Moisture content, Moisture availability, Soil pressure, Hydraulics, Moisture tension, Hydraulic conductivity, Soil types, Steady flow, Soil texture, Percolation, Infiltration rates, Groundwater movement.
Identifiers: *Layered soils, *Potential profiles.

The effect of abrupt textural change on the shape of the steady-state potential profiles in a layered porous medium was examined both theoretically and experimentally. It was shown that a variety of shapes are possible, depending on the rate of flow, layering sequence, and the hydrologic properties of the layers. Three distinct shapes of the potential profiles and the requirements for their development in a two-layered system were discussed. (Prickett-ISWS)
W76-01853

DESIGN AND USE OF CLOSED-TOP INFILTROMETERS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. M. Dixon.
Soil Science Society of America Proceedings, Vol 39, No 4, p 755-763, July-August 1975. 8 fig, 14 ref.

Descriptors: *Infiltrometers, *Pressure, Surface waters, Pressure head, Infiltration, Instrumentation, Infiltration rates, Porous media, Heterogeneity, Air-earth interfaces, Soils, Data collections, Design, Border irrigation, Loam, Saturation, Soil management, Watershed management, Measurement, Soil surfaces, Boundaries(Surfaces).
Identifiers: *Infiltration measurement, Two-phase infiltration, Soil air pressure, Macroporosity, Surface water head, Air counterflow, Initial conditions.

Several similar closed-top infiltrometers were designed and used to simulated effective surface heads ranging from minus 3 to plus 1 cm of water. Design was based on the principle that natural positive soil air pressure may be simulated by creating an equivalent negative air pressure above ponded surface water. Effective surface head h sub s, defined as the difference between the ponded water depth h sub w, and either the actual or simulated soil air pressure head h sub a, is negative when h sub a is greater than h sub w. Under natural field conditions, negative h sub s often causes counterflow of soil air during water infiltration. Narrow ranges in h sub s surrounding zero greatly affect infiltration by controlling air and water flow in soil macropores and weakly hydrophilic micropores. Thirty-minute cumulative infiltration increased 19% per centimeter increase in h sub s for one soil and 33% per centimeter for another soil. Closed-top infiltrometers make possible realistic infiltration measurements under the negative h sub s commonly produced by rain and irrigation waters as they infiltrate natural soils. These devices may also be useful in studying the infiltration effects of several interacting parameters that are related to h sub s, including soil surface macroporosity and roughness, macropore space extent and continuity, antecedent soil air and water, surface wettability and water repellency, wetted surface area and shape, and surface crust and slope. (Visocky-ISWS)
W76-01854

SOIL-GEOMORPHIC RELATIONSHIPS IN FIRST-ORDER VALLEY IN CENTRAL NE YORK,
New York State Coll. of Agriculture and Li Sciences, Ithaca. Dept. of Agronomy.
W. E. Hanna, L. A. Daugherty, and R. W. Arnol
Soil Science Society of America Proceedings, V 39, No 4, p 716-722, July-August 1975. 3 fig, 3 ta 20 ref.

Descriptors: *Soils, *Geomorphology, *N York, Valleys, Watersheds(Basins), Glaciati Terraces(Geologic), Solifluction, Stratigraph Soil profiles, Soil surveys, Soil types
Identifiers: *Soil mapping, Fragiochrep Fragiaquepts, Dystochrepts, Periglacial, S morphology, Hillslope, Cirque-like basin, Val bottom.

Morphologically the soils in Hemlock Cre watershed are related to geomorphic developm since glaciation. Initial drift deposits covering 75-ha area in south-central New York w modified by mass movement (solifluction) then altered by fluvial aggradation-degradat under a periglacial environment and by erosion more recent times. Eight soil profiles represen tive of the geomorphic components forming watershed were evaluated. Fragiochre dominate the shoulder, backslope, and upper fo slope components. They are also the major s on congeliturbate terraces and on step-treds of upper basin. Fragiaquepts are common on lower footslope and toeslope components and a occur on portions of the step-treads of the cirq like basin. Fragipans have formed in both gla till and congeliturbate deposits, indicating pedologic origin. Structural expression and dens of the pans increase with a decrease in natu drainage in both deposits. Dystrochrepts are do nant soils on the summit and on the intermedi level fluvial terraces; entisols occur on the l level alluvial terraces. Pan formation was thou to be precluded by nearness of bedrock (less t 1 m) to the surface in the summit area and matrix textures in the fluvial terraces. Str graphic changes that produce distinct discontin ties in fluvial terrace profiles were readily evid Incipient stratification in congeliturbate depo appeared to affect soil morphology, especi horizon thickness, in these relatively young s (Lee-ISWS)
W76-01855

MEASURING SOIL CREEP,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 7B.
W76-01856

SOME EFFECTS OF CADMIUM CONIFEROUS FOREST SOIL/LITT MICROCOSMS,
National Ecological Research Lab., Corva Oreg.
For primary bibliographic entry see Field 5B.
W76-01862

WATER BALANCE STUDIES,
Food and Agriculture Organization of the Un Nations, Rome (Italy); and International Ato Energy Agency, Vienna (Austria). Div. of Ato Energy in Food and Agriculture.
For primary bibliographic entry see Field 3F.
W76-01882

RADIATION EQUIPMENT AND THE PRIN PLES INVOLVED IN ITS USE,
Food and Agriculture Organization of the Un Nations, Rome (Italy); and International Ato Energy Agency, Vienna (Austria), Div. of Ato Energy in Food and Agriculture.
Y. Barrada.
In: Report of the FAO/UNDP Regional Sem on Effective Use of Irrigation Water at the F

Damascus, Syria, December 7-13, 1971. Ir-
n and Drainage Paper No 13: Water Use
r, Damascus, Water Resources and
pment Service, Land and Water Develop-
ivision, Food and Agriculture Organization
United Nations, Rome, 1972. p 97-102, 1
ef.

ptors: *Soil moisture, *Nuclear moisture
, *Moisture content, *Soil density probes,
ter, Soil moisture meters, Instrumentation,
r meters, Soil density, Soil physical proper-
il surfaces, Radiation, Gamma rays.
iers: *Gamma density probe.

uipment consists of a probe containing the
on source and a detector and electronic
r. Probes for soil moisture determination
eutron source while those for density mea-
ents contain a gamma source. The count rate
ed by the scaler or rate meter is used for
g the corresponding value of soil moisture or
ensity on a calibration chart. The different
of radiation equipment and the principles in-
l in their use that are discussed include (1)
utron moisture meter, including the source,
tector, the design, and the resolution of the
(2) the gamma density probe, (3) the two
gamma probe, and (4) surface probes. (See
76-01878) (Robinett-Arizona)
01883

ACE IRRIGATION METHODS AND
TICES,
and Agriculture Organization of the United
ns, Cairo (Egypt). Near East Regional Of-

rimary bibliographic entry see Field 3F.
01885

Lakes

IC PRIORITIES FOR GREAT LAKES
EARCH,
t Lakes Basin Commission, Ann Arbor,
.
rimary bibliographic entry see Field 5G.
-01515

EE-DIMENSIONAL SIMULATION OF
RMALLY-INFLUENCED HYDRODYNAM-
LOWS,
ford Univ., Calif. Dept. of Civil Engineering.
rimary bibliographic entry see Field 5B.
-01518

LUATION OF SATELLITE REMOTE
SING AND AUTOMATIC DATA
HNIQUES FOR CHARACTERIZATION OF
TLANDS AND COASTAL MARSHLANDS,
onal Space Technology Lab. Bay St. Louis,
s. Earth Resources Lab.
primary bibliographic entry see Field 7B.
-01531

E DYNAMICS OF NUTRIENT LIMITATION
PHYTOPLANKTON ALGAE: A MODEL
CONSIDERED,
sas Univ., Lawrence. Dept. of Systematics
Ecology.
J. O'Brien.
logy, Vol 55, No 1, p 135-141, 1974. Illus.

scriptors: *Phytoplankton, Eutroplication,
rient requirements.

model of phytoplankton nutrient dynamics
ilar to that proposed by Dugdale (1967) simu-
s the dynamics of phytoplankton-nutrient in-
actions in lakes. Phytoplankton population
shes similar to those commonly observed in
ing phytoplankton blooms occur during simula-
tion whenever large amounts of the limiting nutrient are initially provided. The model shows the phytoplankton death rate as an important influence on the steady state nutrient concentration and population density. Zooplankton grazing appears to be potentially important in triggering blue-green algal blooms and in maintaining high phytoplankton species diversity; phytoplankton mortality caused by settling may be a factor in the seasonal succession of plankton algae. Two potentially confounding factors-nutrient regeneration from dead cells and multiple limiting nutrients-are shown to have no significant effect on the properties of the model--Copyright 1974, Biological Abstracts, Inc.
W76-01540

SOLUTE BALANCE AT ABERT AND SUMMER LAKES, SOUTH-CENTRAL OREGON,
Geological Survey, Reston, Va.
A. S. VanDenburgh.
Available from Supt. of Documents, GPO, Wash., DC 20402 price $2.35. Professional Paper 502-C, 1975. 29 p, 14 fig, 1 plate, 10 tab, 24 ref.

Descriptors: *Dissolved solids, *Saline lakes, *Oregon, *Chemical analysis, *Hydrologic data, Impoundments, Inflow, Surface waters, Groundwater.
Identifiers: *Albert Lake(Oreg), *Summer Lake(Oreg), *Closed basins.

Neighboring Abert and Summer Lakes occupy the broad flat floors of deep, topographically enclosed basins in the high desert of south-central Oregon. The two saline lakes and their tributary areas provide contrasting hydrologic environments well suited to an investigation of the various aspects of solute economy. Exclusive of direct precipitation, Lake Albert received about 90 percent (62,000 acre-ft) of its average annual water supply from the snow-fed Chewaucan River. Summer Lake, in contrast, derives about 74 percent (67,000 acre-ft per year) of its inflow from Ana Springs via Ana River. Prior to impoundment of the river and inundation of the springs, the annual contribution averaged about 100,000 acre-feet (83 percent of the total). The Chewaucan River at its mouth carries an average of about 120 mg/litre of dissolved solids, whereas the flow of Ana Springs contains 160 mg/litre. The relation between incoming and stored solutes at the two lakes contrasts sharply. Total salts and chloride stored in Lake Albert and within the top 5 feet of bottom and playa sediments are, respectively, 8,000 and 16,000 times the average present-day income, whereas comparable values at Summer Lake are only about 1,000 and 2,000 (the higher values for chloride reflect its enrichment relative to carbonate and bicarbonate). (Woodward-USGS)
W76-01570

LAKES OF OREGON: VOLUME 3. HOOD RIVER, MULTNOMAH, WASHINGTON, AND YAMHILL COUNTIES,
Geological Survey, Portland, Oreg.
M. V. Shulters.
Open-file report, 1975. 93 p, 7 fig, 1 tab, 19 ref.

Descriptors: *Hydrologic data, *Water quality, *Lakes, *Reservoirs, *Oregon, Lake morphology, Chemical analysis, Water temperatures, Water utilization, Bathymetry, Contours.
Identifiers: *Hood River County(Oreg), *Multnomah County(Oreg), *Washington County(Oreg), *Yamhill County(Oreg).

This inventory of 61 lakes and reservoirs in Hood River, Multnomah, Washington, and Yamhill Counties, Oregon, includes data in hydrology, water quality, water use, and a bathymetric map for each lake. The report provides information for use by city, county, and State planning groups as well as for sportsmen, tourists, and others interested in preserving the recreational value of Oregon's lakes. In addition to office compilation of existing data, each lake was also visited. Most visits were made in summer or early fall when lakes were most accessible and when water temperature and biological activity were at a maximum. (See also W75-03968 and W74-06270) (Woodward-USGS)
W76-01579

AN INTRODUCTION TO THE PROCESSES, PROBLEMS, AND MANAGEMENT OF URBAN LAKES,
Geological Survey, Menlo Park, Calif.
L. J. Britton, R. C. Averett, and R. F. Ferreira.
Circular 601-K, 1975. 22 p, 6 fig, 1 tab, 50 ref.

Descriptors: *Lakes, *Water quality, *Water pollution sources, Reviews, Water pollution effects, Chemical properties, Physical properties, Biological properties, Thermal pollution, Eutrophication, Sedimentation, Water pollution control.
Identifiers: *Urban lakes, Lake management.

The multiple uses of lakes have made them susceptible to water-quality problems such as algal blooms, sediment deposition and fish kills. These problems are products of the eutrophication process (enrichment, aging and extinction of lakes), which is often accelerated by man. Therefore, it is important to understand the properties and processes of lakes which govern lake enrichment, and the measures available to control enrichment. Lakes are described in terms of their physical (light penetration, temperature, sediment, and morphology), chemical (chemical constituents, plant nutrients, and dissolved gases) and biological (plankton, benthos, and nekton) properties. These properties are all interrelated, and are important variables to evaluate water quality. In addition, lake processes, such as photosynthesis, respiration, eutrophication, and biogeochemical cycling, are important factors in determining the sources and extent of enrichment, and managing a lake for maximum benefit. (Woodard-USGS)
W76-01588

DEVELOPMENT AND ECOLOGY OF SKUJA IN THE SWEDISH LAKE TRUMMEN,
Lund Univ. (Sweden). Limnological Inst.
G. Cronberg.
Sven Bot Tidskr. Vol 67, No 1, p 59-64, 1973. Illus.

Descriptors: *Water pollution, *Lakes, Algae, Spores, *Reclamation, Europe.
Identifiers: Akinetes, Lake Trummen, Raphidiopsis-Mediterranea, Sweden, Skuja.

R. mediterranea was recorded for the first time in Sweden in Lake Trummen, a polluted lake which now is being restored. The alga was followed for several years. At its maximum development the alga occurred abundantly. It showed great seasonal variability and developed akinetes with spores. Earlier discrepancies on the morphology were apparently caused by differences in the state of development.--Copyright (c) 1974, Biological Abstracts, Inc.
W76-01621

THE ROLE OF AMINO ACIDS IN THE NITROGEN CYCLE OF LAKE MENDOTA,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W76-01654

NITROGEN, PHOSPHORUS AND CARBON CYCLES IN A DISTURBED EUTROPHIC ECOSYSTEM,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W76-01656

CHYDORID (CLADOCERA) ECOLOGY: SEASONAL PATTERNS AND ABUNDANCE OF POPULATIONS IN ELK LAKE, MINNESOTA,
Tennessee Univ., Knoxville. Dept. of Zoology.
M. C. Whiteside.
Ecology. Vol 55, No 3, p 538-550, 1974. Illus.

Descriptors: *Crustaceans, Aquatic populations, Distribution patterns.
Identifiers: Elk Lake(Minn).

Population dynamics of chydorids from Elk Lake, Minnesota (USA) were followed from May through Oct. 1971 by means of 3 collecting methods. Emphasis was placed on data obtained by use of artificial substrate. This method was found to collect most species of chydorids living in the underlying substrate. A 2nd method, funnel trapping, collected animals that migrated 10-20 cm vertically from their substrate into the funnel traps. Funnel trapping was found to be not very efficient at collecting all chydorid species, but to be useful for following overall population trends and for exploring the vertical movements of some species. A 3rd method, called pattern sampling, was tried experimentally. It appears to collect most chydorid species, and also shows the micro-distributions (or spatial arrangements) associated with population densities. Most chydorid species increase in population numbers during spring and fall, and decrease during midsummer. Chydorids have clumped or contagious patterns that fit the negative binomial distribution. A log/log relationship exists between estimates of the mean and variance over the sampling interval, May-October; this relationship established a relatively constant structural arrangement patterns as reflected by the exponent k of the negative binominal, and by b of Taylor's power law. There are several possible explanations for chydorid clumping-heterogeneous habitat, aggregation about food sources, predation, lack of dispersal and behavior. Future studies will be directed at evaluating the relationships between spatial patterns and population densities.--Copyright 1974, Biological Abstracts, Inc.
W76-01719

ZOOPLANKTON COMPETITION AND PREDATION: AN EXPERIMENTAL TEST OF THE SIZE-EFFICIENCY HYPOTHESIS,
Wisconsin Univ., Madison. Dept. of Zoology.
S. I. Dodson.
Ecology, Vol 55, No 3, p 605-613, 1974. Illus.

Descriptors: *Zooplankton, Competition, Predation.
Identifiers: Daphnia middendorffiana, Daphnia minnehaha, Diaptomus shoshone.

Twelve 42-l plankton cages were used in an alpine Colorado (USA) pond to test the size-efficiency hypothesis: to determine why small herbivorous zooplankton species tend not to coexist with large species. The size-efficiency hypothesis, that large species exclude the smaller ones through competition for food, was not substantiated. An alternate hypothesis extends the understanding of the importance of size-selective predators to include invertebrates selecting small prey. A predaceous copepod Diaptomus shoshone excluded the small Daphnia minnehaha from an association with the large D. middendorffiana within 1 mo. By implication, the predacious copepod is responsible for the absence of the small species in ponds occupied by the large Daphnia species.--Copyright 1974, Biological abstracts, Inc.
W76-01729

FRY DISTRIBUTION IN THE LOWER SVIYAGA BAY OF THE KUIBYSHEV RESERVOIR, (IN RUSSIAN),
Kazan State Univ., (USSR).
V. A. Kuznetsov.
Gidrobiol Zh. 9(5). 76-80 Illus. 1973.

Descriptors: *Bays, *Fry, Fish, Spawning, Fish reproduction
Identifiers: Bleak, White bream, Bronze, Ide, Kuibyshev, Perch, Pike, Roach, Sviyaga Bay, USSR, Walleye, Zope.

The Sviyaga Bay of the Kuibyshev Reservoir (USSR) is a shallow body of water with an average depth of 3 m; depths to 20 m in individual areas of the former channel of the Sviyaga River. A study of the distribution of bronze bream, roach, ide, zope, white bream, bleak, pike, perch and walleye in the bay revealed that the fry concentrate mainly in places protected against the prevailing winds, where rich aquatic and littoral vegetation develops and zooplankton is more abundant than in open regions. In spring the utilization of the spawning grounds also depends on the character of the winds. The migration of fry from the shore at this time is related to a decrease in water level.--Copyright 1975, Biological Abstracts, Inc.
W76-01752

THE CHEMICAL COMPOSITION OF THE UPPER LAYER OF SAPROPEL FROM THE VIITNA LAKES, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
A. Lindpere.
Eesti Nsv Tead Akad Toim Biol. 23(4): 343-347 1974. (Engl. summ).

Descriptors: *Chemical analysis, *Sediments, *Lakes.
Identifiers: Estonian-SSR, *Sapropel, Sparganium-Friesii, *USSR(Viitna Lakes).

The results of chemical analyses of 24 samples of sapropel collected at a depth of 0-20 cm from the lakes Viitna Linajarv and Viitna Pikkjarv in Estonia (USSR) are presented. The contents of ash, Si02, Ca0, Fe203,Al2O3, P205, K20 and Na20 are given. The contents of organic C, O, H and N and trace elements are given on the basis of a number of analyses. (Sparganium friesii was studied.)--Copyright 1975, Biological Abstracts, Inc.
W76-01753

THE EFFECT OF OZONE ON THE DISSOLVED ORGANIC SUBSTANCES IN THE WATER OF LAKE CONSTANCE (WIRKUNG VON OZON AUF DIE GELOESTEN ORGANISCHEN SUBSTANZEN IM BODENSEEWASSER),
For primary bibliographic entry see Field 5C.
W76-01760

PARTICIPATION OF MICROORGANISMS IN SULFUR TURNOVER IN POMIARETZKOE LAKE, (IN RUSSIAN),
Akademiya Nauk SSSS, Moscow. Institut Mikrobiologii.
For primary bibliographic entry see Field 5C.
W76-01774

WAVE HEIGHT INDICATOR LITERATURE SEARCH AND VENDOR SURVEY,
For primary bibliographic entry see Field 2L.
W76-01834

THE LONG-PERIOD INTERNAL WAVES IN LAKE BIWA,
Tokyo Univ. of Fisheries (Japan). Dept. of Marine Environmental Engineering.
S. Kanari.
Limnology and Oceanography, Vol 20, No 4, p 544-553, July 1975. 9 fig, 2 tab, 9 ref.

Descriptors: *Internal waves, *Thermal stratification, *Seiches, *Boundary processes, *Coriolis force, Wind velocity, Rotational flow, Temperature, Solar radiation, Numerical analysis, Model studies, Lakes.
Identifiers: *Lake Biwa(Japan), Spectral analysis.

Heating of the surface layer by solar rad
makes remarkable growth of the thermocli
Lake Biwa, the largest lake in Japan, during
summer to late autumn. The density distribut
the lake during the season of thermal stratific
can be considered to approximate a two
structure. The problem of the effect of the e
rotation on the long-period internal seiches
lake was approached by use of a two-layere
merical model with 25 by 62 square meshes
km intervals. It was assumed that a constant
stress is suddenly imposed on the surface
model lake that has no motion initially an
after a given duration the wind stress sud
vanishes. The pattern of oscillations obtained
the numerical model was essentially the sa
that in a two-layered rotating rectangular
Such rotatory behavior of the internal wave
sistent with the results of spectral analysis o
perature records. (Singh-ISWS)
W76-01845

2I. Water In Plants

AN INFORMATION RETRIEVAL SYSTEM THE MACROINVERTEBRATE FAUNA O DIANA RIVERS AND LAKES,
Purdue Univ., Lafayette, Ind. Water Res
Research Center.
W. P. McCafferty.
Available from the National Technical In
tion Service, Springfield, Va 22161 as PB24
$3.50 in paper copy, $2.25 in microfiche. Tec
Report No 70, September 1975, 5 p. OWRT-
IND(1).

Descriptors: *Systematics, *Baseline s
Data storage and retrieval, *Indiana, *Infor
retrieval, Invertebrates, Lakes, Rivers, Da
lections.
Identifiers: *Ephemeroptera, Broadhurst U
system, Retrieval index, Retrieval systems.

Spatial, temporal, and micro-habitat data
sociated with comprehensive benthic and te
al samples of Ephemeroptera from through
diana taken over the past three and one-half
Objectives were to implement a utilitarian
system to provide the needed capability
relating available subsets of environmenta
This model would then be available for
biological predictions concerning environ
water quality. The system is unique since it
the natural ecological distribution of an
aquatic fauna for a broad geographic a
storage and retrieval system was designe
the Broadhurst Uniterm System. Various
cations of this system were made in order
comodate the ecological and taxonomic d
which it has not been used previously. This
essentially consists of (1) the samples; (2)
cession index: and (3) the uniterm retrieval
All information is completely cross referen
the system. The system is open ended so th
new categories or information can be incorp
at any time. The model initially consists o
separate Indiana accessions and over 880 s
data uniterms within 17 categories and
average of 91 references per uniterm for a
over 80,000 accession numbers or refere
puts.
W76-01513

A MODEL OF ION TRANSPORT DU MOISTURE FLOW FROM A DOUGLA FOREST FLOOR,
Minnesota Univ., Minneapolis. Dept. of E
and Behavioral Biology.
J. G. McColl.
Ecology, Vol 54, No 1, p 181-187, 1973. Illus

Descriptors: *Ion transport, Forest
*Douglas fir trees, Microenvironment.
Identifiers: Pseudotsuga Menziesii.

lectrical conductivity and flow-rate of solu-
n a forest floor were continuously monitored
field using a tension-lysimeter system cou-
vith automated recording instruments. Forest
temperature was also automatically
ded. The field study site was in a uniform
rowth Douglas-fir (Pseudotsuga menzeisii)
on a glacial outwash soil in western
ington. Total ion amounts released from the
t floor during the movement of individual
ng fronts resulting from natural precipitation
calculated. These field data, together with
obtained in the laboratory, were used to
op a model of the transport process. Over the
erature range experienced in the field, I,
h is the total ion amount transport by given
flow of solution, can be described by the al-
ic model: I=M/1+A exp(-BT),
<T<20C) where M is the maximum ion
nt transported by the given flow, T is the
temperature of the dry period preceding
, and A and B are constants. Values of M, A
B are also given for total flows up to 26 mm,
at I can be calculated for any combination of
and temperature.--Copyright 1973, Biological
racts, Inc.
-01613

MIGRATION OF FLY LARVAE IULIIDAE) IN WATER WITH HIGH ELS OF TURBIDITY(IN RUSSIAN).
demiya Nauk Latviiskoi SSR, Riga. Inst. of
ogy.
T. Shternbergs.
v Psr Zinat Akad Vestis. 1 p 28-31, 1973.

criptors: Insects, *Larvae, *Migration,
rbidity currents, Rivers, *Migration patterns,
utants, Water pollution effects.
ntifiers: Fly larvae, Odagmia-Ornata, Simu-
ae, Simulium-Argyreatum, USSR.

migration of fly larvae in the Ligupit River of
Latvian SSR (USSR) involved 89% Simulium
yreatum and 11% Odagmia ornata. Under nor-
l conditions the migration rate was considerably
er at night than in the day. Less larvae were
nd migrating in the bottom layer and on the sur-
e. The majority travelled 2.5-12.5m. As turbidi-
ncreased, the migration rate increased substan-
ly. Under turbid conditions most larvae
grated 10-22.5m. In the bottom layer, the rate
not increase. O. ornata comprised 3.6% of the
grating larvae in turbid water due to its greater
ological plasticity. Adaptability was a factor in
widespread distribution and presence in pol-
ed waters.--Copyright 1974, Biological Ab-
acts, Inc.
76-01615

RFACE ALBEDO AND DESERTIFICATION,
gricultural Research Service, Water Conserva-
n Lab. Phoenix. Ariz.
r primary bibliographic entry see Field 2B.
76-01705

ELATIONSHIPS BETWEEN SELECTED HYSICAL PARAMETERS AND BENTHIC OMMUNITY STRUCTURE IN A SMALL OUNTAIN STREAM,
Yoming Univ., Laramie. Water Resources
esearch Inst.
. A. Kimble, and T. A. Wesche.
vailable from the National Technical Informa-
on Service, Springfield, Va 22161 as PB-247 416,
4.50 in paper copy, $2.25 in microfiche. Water
esources Series No 55, March 1975. 65 p, 18 tab,
3 fig, 26 ref, append. OWRT B-023-WYO(3). 14-
1-0001-4143.

Descriptors: *Streams, *Benthos, *Benthic fauna, Biological communities, Biomass, Aquatic habitats, Depth, Velocity, *Wyoming.

The benthic community present in a stream is dependent upon or regulated by chemical, biological, and physical factors. Three important physical factors which can influence the composition of benthic organisms are substrate, water velocity, and water depth. Four different substrates in a small Wyoming mountain stream were compared as to benthic community structure. The substrate types sampled were silt, sand and fine gravel, coarse gravel, and rubble. Highest mean number and mean biomass were found in the samples taken in rubble. Point and mean velocities also were measured for each sample taken. Greatest mean number and mean biomass were found at mean velocities of 0.50 foot-per-second (0.152 meter-per-second) or higher. Mean depth data indicated a preference by benthic organisms for depths of less than one foot (0.305 meter).
W76-01803

ROOT DEPTH AS A SENSITIVE PARAMETER IN A DETERMINISTIC HYDROLOGIC MODEL,
Agricultural Research Service, Beltsville Md. Hydrograph Lab.; and Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
C. B. England.
Water Resources Bulletin, Vol 11, No 5, p 1046-1051, October 1975. 4 fig, 14 ref.

Descriptors: *Root zone, *Depth, *Model studies, *Hydrologic aspects, *Root development, Parametric hydrology, Hydrologic data, Watersheds(Basins), Evaporation, Transpiration, Soil moisture, Lysimeters, Groundwater, Percolation, Soil water movement, Pores, Gravitational water, Evaporation pans, Air temperature, Bromegrass, Alfalfa.
Identifiers: *Muskingham silt loam, USDAHL-74 watershed hydrology model, Breakpoint precipitation.

Deterministic models of watershed hydrology require accurate a priori estimates of soil, vegetation, and watershed parameters. Physical fidelity of these values to those of the prototype natural watershed is essential. One vegetation parameter most neglected is plant root activity. Plant roots directly or indirectly affect many hydrologic processes, including evaporation, transpiration, soil moisture, and ground water. One of their more inportant functions is in opening surface- connected hydraulic pathways for rainfall penetration. Numerical trials of computing evapotranspiration and percolation from a 96-inch-deep lysimeter continuously cropped to bromegrass-alfalfa were conducted, using the USDAHL-74 Model of Watershed Hydrology. Comparisons of computed versus observed values indicated that the alfalfa roots had penetrated, or at least were withdrawing water from, the full depth of the lysimeter. The results illustrated the adaptability of the watershed model to soil moisture accounting, its sensitivity to the root depth parameter, and the need for rational determination of input parameters. (Visocky-ISWS)
W76-01846

A STUDY OF LAGOONAL AND ESTUARINE PROCESSES IN THE AREA OF MERRITT ISLAND ENCOMPASSING THE SPACE CENTER--ANNUAL REPORT, 1 JUL. 1973--31 AUG. 1974.
Florida Inst. of Tech., Melbourne.
For primary bibliographic entry see Field 2L.
W76-01893

EFFECTS OF QUALITY AND QUANTITY OF FOOD ON GOLDEN SHINER, NOTEMIGONUS CRYSOLEUCAS, PRODUCTION,
Arkansas Univ., Fayetteville. Dept. of Zoology.
R. V. Kilambi, and R. B. Roseberg.
Available from the National Technical Information Service Springfield, Va 22161 as COM-74-11143, $4.50 in paper copy, $2.25 in microfiche. Final Report to Arkansas Game and Fish Commission for Research Project 2-162-R, p 1-54, 1974, 3 fig, 9 tab, 27 ref.

Descriptors: *Fish physiology, *Growth rates, *Temperature, *Commercial fish, *Nutrient requirements, Fish diets, Density, Arkansas.
Identifiers: *Golden Shiner, Notemigonus crysoleucas.

The effects of quality of food (protein level) and stocking density on growth and temperature tolerance on production of golden shiner, Notemigonus crysoleucas were investigated. The best growth was achieved at the least dense 20 fish per 60 gallons and 38% protein feed condition. Temperature tolerance tests showed no consistent differences between any conditions except at 36 fish at 28% protein level condition. (Klein)
W76-01900

BIBLIOGRAPHY ON NUTRITIONAL REQUIREMENTS OF WARM WATER FISHES (BIBLIOGRAPHIE SUR LES BESOINS NUTRITIFS DES POISSONS VIVANT EN EAUX CHAUDES),
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station; and Ministry of Agriculture, Dor (Israel). Dept. of Fisheries.
B. Hepher, and J-L. Gaudet.
European Inland Fisheries Advisory Commission, Occasional Paper No 10, Food and Agriculture Organization of the United Nations, Rome 1975. 87 p, 1000 ref.

Descriptors: *Bibliographies, Publications, *Fish food organisms, *Nutrient requirements, *Fish management, *Fish diets, *Warm-water fish, Essential nutrients, Fish farming, Freshwater fish, Nutrients.

This bibliography on the nutritional requirements of warm water fish was prepared at the request of the EIFAC workshop on Fish Feed Technology and Nutrition. (Katz)
W76-01915

PINE ASSOCIATIONS OF THE DERNOVICH STRETCH OF THE PRIPYAT RIVER FLOOD-PLAIN, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralyn Botanichny Sad.
V. N. Kisyalyev, K. D. Chubanav, A. V. Bortnik, A. V. Zavryyev, and V. V. Ihnatsyenka.
Vyestsi Akad Navuk B SSR Syer Biyal Navuk, Vol 2, p 18-23, 1974. Illus.

Descriptors: Forests, *Coniferous forests, *Pine trees, *Flood plains, Rivers, *Geomorphology, *Hydrologic properties, *Soils.
Identifiers: Dernovich, Pripyat River, USSR.

A study of the geobotanical characteristics of the pine forests on the Dernovich stretch of the Pripyat River floodplain (USSR) revealed 3 associations of floodplain pine forests: Pinetum cytisio-pleurozioso-fluvialis, Pinetum pleurozioso-fluvialis and Pinetum cytisio-graminoso-fluvialis. The edaphic, geomorphologic and hydrologic characteristics of the floodplain pine forests are presented.--Copyright 1975, Biological Abstracts, Inc.
W76-01918

EFFECT OF WATER MOVEMENT ON VIABILITY OF MICROCYSTIS AERUGINOSA KUTZ. EMEND. ELENK, (IN RUSSIAN),
Akademiya Nauk USSR, Kiev. Instytut Hidrobiologii.
V. I. Bykovskii.
Gidrobiol Zh, Vol 10, No 4, p 43-47, 1974. Illus. (English summary).

Descriptors: *Physiological ecology, Population, Aquatic populations.
Identifiers: *Microcystis-aeruginosa.

Changes in water velocity evoke changes in the number and survival rate of Microcystis colonies. Possible ways to increase the number of the colonies and to change their physiological state are considered.--Copyright 1975, Biological Abstracts, Inc.
W76-01919

2J. Erosion and Sedimentation

EVALUATING IRREGULAR SLOPES FOR SOIL LOSS PREDICTION,
Purdue Univ., Lafayette, Ind.
G. R. Foster, and W. H. Wischmeier.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 17, N0 2., p 305-309, March-April 1974. 3 fig, 8 ref.

Descriptors: *Soil erosion, Soil management, Soil conservation, Erosion, Slope stability, Topography, Evaluation, Agriculture, Construction, *Slopes, Degradation(Slope).
Identifiers: Soil erosion prediction.

The effects of slope irregularities on soil erosion by water were analyzed on the basis of recent progress in mathematical simulation of the basic erosion processes. This report presents the analysis and extends it to routine field application. A technique is proposed for evaluating the universal soil-loss equation's topographic factor, LS, for irregular field or construction-site slopes. The technique also provides a means of evaluating the effects of differences in soil erodibility that may be associated with changes in slope steepness. It does not, however, predict deposition that may occur on a slope. Irregular slopes are not accurately evaluated by using average values for slope steepness and soil erodibility in combination with overall length, and additional very helpful detail can be readily obtained. The proposed technique has direct application value both on farmland and on construction sites. (Skogerboe-Colorado State)
W76-01567

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-01577

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES. LEG 15,
Woods Hole Oceanographic Institution, Mass.
F. L. Sayles, F. T. Manheim, and L. S. Waterman.
In: Initial Reports of the Deep Sea Drilling Project, Volume 20, National Science Foundation, p 783-804, 1973; Washington, D.C. US Government Printing Office. 22 p, 2 fig, 9 tab, 15 ref.

Descriptors: *Connate water, *Sediments, *Chemical analysis, *Pore water, Bottom sediments, Oceans, Core drilling, Analytical techniques, Inorganic compounds, Geochemistry, Temperature.
Identifiers: *Caribbean Sea, Squeezing.

Major and some minor chemical constituents were studied in pore fluids of 123 samples from three drill sites in the Caribbean Sea. Site 147 (Cariaco Basin) yielded pore fluids resembling those from other clayey and rapidly deposited sediment accumulations near shore. Strong depletions in SO4 and substantial depletions in K, Ca, and Mg accompany increases in alkalinity. Toward the bottom of the site, a decrease in the normally 'conservative' (i.e. unreactive) constituents, Na and Cl, reached nearly 10% of about 180 meters depth. The cause of this apparent dilution is still unknown, but it resembles similar dilutions found in other rapidly deposited sediment pockets influenced by proximity to continental masses. At Sites 147, 148, and 149 concentration changes of Ca, Mg, K, HCO3, and SO4 in most samples are compatible with a reaction model based on sulfate reduction, uptake of magnesium on clays, and precipitation of carbonates. The temperature of squeezing affects cation results in all sites. Greatest relative influence of temperature of squeezing occurred for boron, with nearly +50 percent increase in clayey-marly strata. In contrast to previous expectations, temperature-related anomalies were only slightly lower for highly calcareous sediments such as chalks than for sediments described as clays and marls. (Woodard-USGS)
W76-01581

MERCURY DISTRIBUTION IN ANCIENT AND MODERN SEDIMENT OF NORTHEASTERN BERING SEA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-01586

HEAVY METAL (CU, PB, ZN, CD, NI, AS, HG) ADDITIONS TO SURFACE WATERS, STREAMS SEDIMENTS AND SELECTED AQUATIC LIFE IN THE MERAMEC PARK RESERVOIR DRAINAGE BASIN, MISSOURI,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W76-01686

A CLOSE-INTERVAL FRACTIONATOR FOR SEDIMENT CORES,
Union Carbide Corp., Tarrytown, N.Y. Environmental Science Program.
A. Fast, and R. G. Wetzel.
Ecology, Vol 55, No 1, p 202-204. 1974. Illus.

Descriptors: *Cores, Core logging, Sampling, Sediments.

Extrusion and fractionation are necessary steps for most sediment core analyses. A new device that rapidly fractionates the core sample as it is extruded from the core tube was designed. The fractionator works well with consolidated or fluid sediments. Results indicate that the fractionator gives representative samples with little or no vertical contamination of the core sample.--Copyright 1974, Biological Abstracts, Inc.
W76-01720

THE SHORT TERM VARIATION IN SUSPENDED SEDIMENT CONCENTRATION CAUSED BY THE PASSAGE OF A BOAT WAVE OVER A TIDAL FLAT ENVIRONMENT,
New Hampshire Univ., Durham. Dept. of Earth Sciences; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
For primary bibliographic entry see Field 2L.
W76-01827

EROSION EVALUATION STUDY,
Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
S. M. Law, and S. J. Vaccaro.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 875, $5.00 in paper copy, $2.25 in microfiche. Research Report 76, June 1974. 70 p, 32 fig, 8 tab, 17 ref, append.

Descriptors: *Erosion, *Erosion control, *Laboratory tests, *On-site investigations, Cover crops, Vegetation establishment, Slopes, Embankments, Erosion rates, Rainfall, Rainfall simulators, Simulated rainfall, Mulching, *Louisiana.

New erosion products, such as mulches or chemical additives for retarding soil erosion or promoting grass stand growth, are evaluated each year. The study attempted to develop a laboratory procedure by which these products can be ev ated, as quickly as possible after they appea the market, in order to screen them so that the one can be further tested in the field. In the phase, the products available were installed selected test slopes in north Louisiana and served. In the laboratory phase, the products installed on plots containing grass seed and f izer and observed to obtain seed germination and on soil in test pans and tested under a rain simulator to get some comparative soil loss Wood fiber mulches and chemical soil binde erosion retardants were used. The principal tors affecting the results obtained in the field the weather conditions; the size, shape, and st ness of the slopes; and the types of soil pre Reports and data dealing with the construction operation of rainfall-simulators, erosion re from other studies, and other pertinent info tion were reviewed. An evaluation of the va pieces of equipment or parts of equipment rel to rainfall-simulators was undertaken also. construction details to the rainfall-simu developed were presented in an appendix. (S ISWS)
W76-01829

HYDRAULIC CONSTANTS OF TIDAL TRANCES, II: STABILITY OF LONG ISL INLETS,
Florida Univ., Gainesville. Coastal and Oce graphic Engineering Lab.
For primary bibliographic entry see Field 2L.
W76-01836

SOIL-GEOMORPHIC RELATIONSHIPS I FIRST-ORDER VALLEY IN CENTRAL YORK,
New York State Coll. of Agriculture and Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-01855

2K. Chemical Processes

SOLUTE BALANCE AT ABERT AND SUM LAKES, SOUTH-CENTRAL OREGON,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2H.
W76-01570

QUALITY OF SURFACE WATERS OF UNITED STATES, 1969: PART 3. OHIO R BASIN.
Geological Survey, Reston, Va.
Available from Superintendent of Docum GPO, Washington, DC, 20402, price $2.85 in cover. Water-Supply Paper 2143, 1974. 371 p, 40 ref.

Descriptors: *Water quality, *Surface *Sediment transport, *Water temperatures, River, River basins, Basic data collec Alabama, Georgia, Indiana, Kentucky, Mary New York, North Carolina, Ohio, Pennsyl Tennessee, Virginia, West Virginia, Physica perties, Sampling, Chemical analysis, Inor compounds, Biological properties, Streamflo
Identifiers: *Ohio River basin.

During the water year ending September 30, the Geological Survey maintained 152 statio 95 streams in the Ohio River basin for the stu chemical and physical characteristics of su water. Samples were collected daily and mo at 92 of these locations for chemical-quality dies. Samples also were collected less frequ at many other points. Water temperatures measured continuously at 74 and daily at 4 tions. Daily water temperatures were measu most of the stations at the time samples wer lected for chemical quality or sediment conte far as practicable, the water temperatures

n at about the same time each day. Quantities suspended sediment are reported for 18 sta-s. Sediment samples were collected one or e times daily at most stations, depending on rate of flow and changes in stage of the stream. icle-size distributions of sediments were deter-ed at 14 stations. The stream discharges re-ed for a composite sample is usually the rage of daily mean discharges for the com-ite period. The discharge reported in the tables ingle analyses are either daily mean discharges lischarges obtained at the time samples were ected and computed from a stage-discharge tion or from a discharge measurement. oodward-USGS)
6-01577

ERSTITIAL WATER STUDIES ON SMALL RE SAMPLES. LEG 15,
ods Hole Oceanographic Institution, Mass.
primary bibliographic entry see Field 2J.
6-01581

OUND WATER IN SELECTED AREAS IN E KLAMATH BASIN, OREGON,
ological Survey, Portland, Oreg.
primary bibliographic entry see Field 2F.
6-01590

ECTROCHEMICAL DETECTION OF NH4 US NH3 SYSTEMS IN WATER,
heries and Marine Service, Winnipeg anitoba). Freshwater Inst.
r primary bibliographic entry see Field 5A.
6-01652

SPERSION AS AN INDEX OF RELATIVE DRAULIC CONDUCTIVITY IN SALT-AF-CTED SOILS OF THE SUDAN,
artoum Univ., Khartoum (Sudan). Dept. of chemistry and Soil Science.
r primary bibliographic entry see Field 2G.
6-01694

ANDARD CONDUCTIVITY CELL FOR MEA-REMENT OF SEA WATER SALINITY AND EMPERATURES,
estinghouse Electric Corp., Pittsburgh, Pa. ssignee).
C. Murdock.
S. Patent No. 3,906,354, 7 p, 11 fig, 5 ref; Offi-l Gazette of the United States Patent Office, l 938, No 3, p 1371, September 16, 1975.

escriptors: *Patents, Water properties, *Salinity, Temperature, *Conductivity, *Water quality, ea water, Equipment, Measurement.
entifiers: Sensors.

e instrument utilizes two conductivity cells, one ll being adapted for measuring the conductivity the water environment acting on the cell, and a cond cell which is a standard cell for measuring e conductivity of a standard sample of water of own salinity. The ratio of the conductivity mea-rements of the two cells is an indication of linity. An output signal is obtained which is pro-rtional to the conductivity ratio and this output gnal is conveyed to a remote location such as by wire link communication. In a preferred con-ruction, first and second electrically insulative embers having spaced apart portions take the rm of first and second thin wall concentric cylin-ers. A standard sample of electrically conducting quid of a known predetermined parameter is con-ined between the two cyclinders. In order to ake electrical contact with the standard sea-ater, first and second electrodes are provided hich are supported by the cylinders and which e in electrical contact with the standard sample. he cylinders are of a size to permit rapid heat ansfer to the standard sample, while still main-ining high mechanical strength. With a known relationship between conductivity and tempera-ture, a reading of the conductivity of the standard cell gives an indication of temperature. Thus an extremely rapid thermister or temperature sensor is provided. (Sinha-OEIS)
W76-01716

THE CHEMICAL COMPOSITION OF THE UPPER LAYER OF SAPROPEL FROM THE VIITNA LAKES, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
For primary bibliographic entry see Field 2H.
W76-01753

USE OF TEST WELLS AS WATER-QUALITY PREDICTIONS,
Wisconsin Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W76-01768

EXTRACTION OF INFORMATION ON INORGANIC WATER QUALITY,
Bureau of Reclamation, Denver, Col. Water Quality Office.
For primary bibliographic entry see Field 5A.
W76-01844

2L. Estuaries

CHEMICAL AND SEDIMENT BUDGETS FOR A SMALL TIDAL CREEK, CHARLESTON HARBOR, S. C.,
South Carolina Univ., Columbus. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-01511

PLANNING FOR COASTAL RECREATION OPPORTUNITIES NEAR LARGE URBAN AREAS: A STUDY RELATING TRANSPORTATION AND RECREATION,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W76-01516

EVALUATION OF SATELLITE REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS AND COASTAL MARSHLANDS,
National Space Technology Lab. Bay St. Louis, Miss. Earth Resources Lab.
For primary bibliographic entry see Field 7B.
W76-01531

SATELLITE RELAY AND PROCESSING OF HYDROLOGIC DATA IN SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7B.
W76-01578

GENERAL MODEL TO SIMULATE FLOW IN BRANCHED ESTUARIES,
Geological Survey, Reston, Va.
J. P. Bennett.
Reprint from Proceedings of the Symposium on Modeling Techniques, held at San Francisco, Calif, September 3-5, 1975: American Society of Civil Engineers, p 643-662, 1975. 4 fig, 5 tab, 8 ref.

Descriptors: *Model studies, *Tidal streams, *Estuaries, *Discharge(Water), *Streamflow, forecasting, Computer models, Methodology, Input-output analysis, Channel flow, Correlation anaylsis, Columbia River, *Oregon.
Identifiers: *Willamette River(Oreg).

The model simulated the time history of stage and discharge in any estuary that can be idealized as a system of interconnected one-dimensional open channels. A unique coding system included in the model input as a part of the description of each cross-section enables the solution algorithm to treat any network of channels without modification of Fortran coding. There are no restrictions as to the number of reaches or junctions that can be considered because the algorithm computes stage and discharge for each cross-section without reference to its location in a particular channel reach or at a junction. Application of the model is illustrated using an extensive data base collected in the Portland, Oregon, harbor on the Willamette and Columbia Rivers. The harbor is idealized as a set of seven interconnected one-dimensional channels. After calibration, the model reproduces observed stages to within a RMS error of 0.2 ft, and discharges to within a RMS error of less than 50 percent of the average absolute value. (Woodward-USGS)
W76-01580

STRATIGRAPHY OF ATLANTIC COASTAL MARGIN OF UNITED STATES NORTH OF CAPE HATTERAS--BRIEF SURVEY,
Geological Survey, Reston, Va.
W. J. Perry, Jr., J. P. Minard, E. G. A. Weed, E. I. Robbins, and E. C. Rhodehamel.
American Association of Petroleum Geologists Bulletin, Vol 59, No 9, p 1529-1548, September 1975. 12 fig, 58 ref.

Descriptors: *Stratigraphy, *Continental shelf, *Northeast US, *Sediment distribution, Geology, Geologic time, Hydrogeology, Oil reservoirs, Sedimentology.
Identifiers: *Hydrocarbons, *Oil potential.

A synthesis of studies of sea-floor outcrops of the sedimentary wedge beneath the northeastern United States continental shelf and slope and a reassessment of coastal plain Mesozoic stratigraphy, particularly of the coastal margin, provide insight for estimating the oil and gas potential and provide geologic control for marine seismic investigations of the Atlantic continental margin. The oldest strata known to crop out on the continental slope are late Campanian in age. The Cretaceous-Tertiary contact along the slope ranges from a water depth of 0.6 to 1.5 km south of Georges Bank to 1.8 km in Hudson Canyon. Few samples are available from Tertiary and Late Cretaceous outcrops along the slope. Mesozoic correlations in coastal wells between coastal Virginia and Long Island have been revised. The Upper-Lower Cretaceous boundary is placed at the transition between Albian and Cenomanian floras. Potential hydrocarbon source beds are present along the coast in the subsurface sediments of Cretaceous age. Potential reservoir sandstones are abundant in this sequence. (Woodard-USGS)
W76-01583

MERCURY DISTRIBUTION IN ANCIENT AND MODERN SEDIMENT OF NORTHEASTERN BERING SEA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-01586

A WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY BASIN, PART 1.
For primary bibliographic entry see Field 5G.
W76-01593

A WATER QUALITY CONTROL PLAN FOR SAN FRANCISCO BAY BASIN, PART 2.
For primary bibliographic entry see Field 5G.
W76-01594

A STUDY OF LAGOONAL AND ESTUARINE PROCESSES IN THE AREA OF MERRITT

ISLAND ENCOMPASSING THE SPACE CENTER.
Florida Institute of Tech., Melbourne.
Annual Report July 1972-August 1974. 69 p. (NASA-CR-140601). NGR 10-015-008.

Descriptors: *Estuaries, *Lagoons, Biological communities, *Florida, Systematics, Benthic fauna, Marine bacteria, Nutrients, Winds, Subtropic, Currents(Water), Bottom sediments, Water quality, Water circulation.
Identifiers: *Kennedy Space Center(Fla), *Haulover Canal(Fla), Indian River(Fla), Banana River(Fla), Merritt Island(Fla), Mosquito Lagoon(Fla).

The study of lagoonal and estuarine ecological processes in the vicinity of the John F. Kennedy Space Center on Merritt Island, Florida is described. The island is located at the apex of the three principal components of the lagoonal complex of east central Florida: the Indian River Lagoon (formerly Mosquito Lagoon), the Indian River, and the Banana River. All the waters are saline and near classical examples of lagoons; but in some areas there is an influx of fresh water and the lagoons have an estuarine character. The findings are reported in separate chapters as biological sampling, microbiological studies, physical aspects, sediment analysis, and water quality parameters. The appendix includes a condensation of a thesis by Richard Evan Dill on the circulation in the lagoons around the Kennedy Space Center and condensation of a thesis by David Richard Browne on the transport of water through the Haulover Canal. (Buchanan-Davidson--Wisconsin)
W76-01657

OBSERVATIONS ON THE ASSOCIATION BETWEEN MERCURY AND ORGANIC MATTER DISSOLVED IN NATURAL WATERS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W76-01757

CLASSIFICATION OF MODELS TO TIDAL WATERS,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W76-01780

CYCLIC STORAGE OF FRESH WATER IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 4B.
W76-01811

THE SHORT TERM VARIATION IN SUSPENDED SEDIMENT CONCENTRATION CAUSED BY THE PASSAGE OF A BOAT WAVE OVER A TIDAL FLAT ENVIRONMENT,
New Hampshire Univ., Durham. Dept. of Earth Sciences; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
F. E. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-003 549, $4.00 in paper copy, $2.25 in microfiche. Technical Report No 2, February 1974. 45 p, 10 fig, 2 tab, 33 ref. ONR N00014-67-A-0158-0007.

Descriptors: *Estuaries, *Tidal marshes, *Waves(Water), *Suspended solids, Tidal waters, Shallow water, Mud flats, Coastal marshes, Boats, Sediments, Erosion, On-site investigations.
Identifiers: *Boat waves.

A series of boat waves were directed across the tidal flat at varying water depths to compare the different amounts of wave energy expended in each area of the tidal flat and to examine the post-boat wave effects on sediment resuspension and deposition. In general, the outer portion (near low tide mark) of the tidal flat received between one third and one half more wave energy than the shallow region. There was a great deal of energy lost through bottom friction as the wave form passed through shallow water. Because of this energy gradient, the outer portion of the tidal flat appeared to be the most dynamic with alternate periods of resuspension and deposition. In contrast, the inner area was primarily depositional. Near the low tide mark, sediments were easily resuspended--yet just as easily deposited. Their apparent high deposition rates were anomalous for the bottom sediments of the area and it was inferred the sediment particles were behaving more like low density aggregates rather than individual grains of silt or clay. The source of these aggregates may be local pelletization by benthic fauna or physical aggregation caused by reworking of the bottom sediments by waves. (Sims-ISWS)
W76-01827

WAVE HEIGHT INDICATOR LITERATURE SEARCH AND VENDOR SURVEY,
H. Carleton.
Available from the National Technical Information Service, Springfield, Va 22161, as COM-74 11788, $3.50 in paper copy, $2.25 in microfiche. National Maritime Research Center, Kings Point, New York, Report NMRC-KP-123, May 1974. 18 p, 6 fig, 23 ref, 1 append. NMRC MA2-4178.

Descriptors: *Waves(Water), *Ocean waves, *Measurement, *Instrumentation, Equipment, Buoys, Oceans, Lakes, Winds, Sampling, On-site investigations, Ships, Weather data, Oceanography.
Identifiers: *Wave height indicators, Wave meters, Wave followers, Deep sea wave meters, Shipborne wave meters.

Heavy weather encountered by ships has resulted in ship and cargo damage, loss of time and many times loss of life. To minimize the adverse effects of heavy weather, ships can reduce speed and change course based on information provided by weather service or routing service organizations. Information provided by these services is derived from observations made by a wide variety of weather stations, including merchant and naval vessels. The data provided by these vessels should be as accurate as the state of the art and financial considerations will allow. Most of the weather data provided by ship observers is generally well instrumented except for the measurement sea state. Wave height and period are visual observations that are difficult to make and have proven to be very inaccurate. It is felt that instrumentation should be provided aboard merchant vessels so that these important parameters can be measured and reported with greater accuracy, especially when heavy weather is encountered. The results of a limited literature search into wave meters that are used aboard ships to observe wave height and wave spectra was reported. Also included was a review of some literature that is available on commercial wave meters that are applicable for use by ships in measuring wave height. (Sims-ISWS)
W76-01834

HYDRAULIC CONSTANTS OF TIDAL ENTRANCES, II: STABILITY OF LONG ISLAND INLETS,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
A. J. Mehta, and H. S. Hou.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-004 992, $5.50 in paper copy, $2.25 in microfiche. Technical Report No 23, November 1974. 96 p, 26 fig, 11 tab, 37 ref, 1 append. ONR NR-388-106 ONR N00014-68-A-0173-0020.

Descriptors: *Estuaries, *Tidal effects, *Hydraulics, *Stability, Littoral drift, Scour, Inlets(Waterways), Sediment transport, Channels, *New York
Identifiers: *Tidal inlets, *Long Island(NY).

The report presented the results of an office study related to the susceptibility of a tidal inlet because of the closure of its mouth. The specific examples explored were the inlets on the south shore of Long Island. The closure of an inlet involves consideration of two opposing agencies, namely (1) the onshore wave energy which tends to drive littoral materials toward the entrance, and (2) the tidal flow which attempts to scour this material helping to keep the entrance channel open. These concepts were applied for hypothetical closing of Long Island inlets. A generalized criterion for stability was proposed, and it was found that this criterion could be used to classify inlest ranging in size from a laboratory model to large natural entrances. (See also W74-12648) (Bhownik-ISWS)
W76-01836

REMOTE SENSING APPLICATIONS IN MARINE SCIENCE PROGRAMS AT VIMS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 7B.
W76-01839

BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W76-01842

THE DISTRIBUTION OF EXCESS TEMPERATURE FROM THE VIENNA GENERATING STATION ON THE NANTICOKE RIVER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 5B.
W76-01843

A STUDY OF LAGOONAL AND ESTUARINE PROCESSES IN THE AREA OF MERRITT ISLAND ENCOMPASSING THE SPACE CENTER--ANNUAL REPORT, 1 JUL. 1973--AUG. 1974.
Florida Inst. of Tech., Melbourne.
Available from the National Technical Information Service Springfield, Va 22161 as PB106 $4.50 in paper copy, $2.25 in microfiche. NASA CR-140601; AR-2, 31 Aug. 1974, 69 p. NGR-015-008.

Descriptors: *Estuaries, *Estuarine environments, *Florida, *Lagoons, Marine animals, Microorganisms, Biological communities, Water quality, Bottom sediments, *Systematics.
Identifiers: *Kennedy Space Center(Fla), *Merritt Island(Fla), Indian River(Fla).

A study was conducted to determine the marine biology and dynamic oceanographic properties of the Indian River in Florida. One of the major areas of concentration involved the compilation of a taxonomic list of marine animals in the river. An important conclusion of the study is that diversity of the benthic community is substantially higher than expected. The effect of major climatic factors on the diversity and structure of the benthic community is analyzed. (See also W76-01894 thru W76-01898).
W76-01893

BIOLOGICAL SAMPLING OF THE LAGOONAL COMPLEX SURROUNDING K (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
K. B. Clark, and J. Thomas.

A Study of Lagoonal and Estuarine Processes
the Area of Merritt Island Encompassing the
ace Center, Annual Report July 1972-August
'4, p I-1--I-15. 3 fig, 4 tab, 4 ref. (NASA CR-
0601). NASA NGR 10-015-008.

scriptors: *Biological communities, *Estuaries,
agoons, Florida, Systematics, Marine animals,
nthic fauna, Invertebrates, Periphyton, Varie-
, Oxidation-reduction potential, Anaerobic
nditions.
ntifiers: Kennedy Space Center(Fla), Merritt
and(Fla), Indian River(Fla).

1974 taxonomic list of marine animals in the In-
n River, Florida, showed that diversity of the
nthic community was higher than expected.
linity eliminated certain major tax such as echi-
ids, asteroids, and scaphopods. Ninety species
re present in benthic grab samples. About 45%
the invertebrate species had boreal or Caroline-
geographic affinites, while other Florida en-
ronments have predominantly Antillean af-
ites. There were 23 species of larger inver-
rates, those on rock substrates, aufwuchs spe-
s, and rare specimens not collected by the grab
mples. Aufwuchs species are seasonal, thus the
al number of species should increase when
asonal studies are completed. Depth, redox
tential, organic carbon, presence of rooted
getation, and sediment significantly affect
versity and community structure. Sediment
dox potential can be used to indicate long-term
ygen availability relative to availability of or-
nic matter in marine sediments. Anaerobic con-
tions occur nocturnally in shallow areas and may
ll some invertebrates, thus limiting species
chness. Significant correlation exists between
dox potential and diversity in samples in grass-
ee areas. Two communities were present: the
rst was a shallow water community dominated by
iplanthera and Cymodoceum, and the second
as less defined. The species occurring are listed.
ee also W76-01893) (Buchanan-Davidson--
isconsin)
76-01894

ICROBIOLOGICAL STUDIES OF THE AGOONAL COMPLEX SURROUNDING KSC (ENNEDY SPACE CENTER),
lorida Inst. of Tech., Melbourne.
. A. Nevin, W. L. Blevins, and C. Noble.
: A Study of Lagoonal and Estuarine Processes
the Area of Merritt Island Encompassing the
pace Center, Annual Report July 1973-August
974, p II-1--II-11. 5 tab, 9 ref. (NASA CR-
40601). NASA NGR 10-015-008.

Descriptors: *Estuaries, *Lagoons, Florida, Microorganisms, *Marine bacteria, Aerobic conditions, Anaerobic conditions, Hydrogen sulfide, ulfur compounds, Inhibitors, Nutrient requirements.
dentifiers: Kennedy Space Center(Fla), Merritt sland(Fla).

Activities of the marine type halophilic microorganisms indigenous to, or adventitiously present in vaters adjacent to the Kennedy Space Center, Florida, were studied. When lagoonal water was nriched with nutrient broth and incubated under nerobic conditions, what appeared to be hydrogen ulfide was produced. Experiments indicated that he reactive substance was probably a thiol mercaptan). Bacterial growth occurred when yrosine, histidine, proline, serine, cystine, nethionine, or glycine were used to enrich agoonal water. Several gram negative rod-shaped organisms (both motile and non-motile), cocci, and spirilla were always found. Vibrio, Benecka, Agarbacterium, and Pseudomonas were tentatively dentified. Addition of serine, methionine, and proline; cystine, proline, histidine, and glycine; serine, histidine, cystine, glycine, and methionine caused greater growth. Glycine inhibited growth when either or both cystine and tyrosine were present. Addition or either cystine or methionine to any non-inhibiting combination enhanced growth. Yeast extract was an excellent growth enhancing substance. Ammonium ion was inhibitory to these organisms. Addition of water soluble vitamins had no effect. The lipid extract of yeast extract caused only slight enhancement, but the extracted residue yielded excellent growth. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01895

PHYSICAL ASPECTS OF THE LAGOONAL COMPLEX SURROUNDING KSC (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
P. S. Dubbelday.
In: A Study of Lagoonal and Estuarine Processes in the Area of Merritt Island Encompassing the Space Center, Annual Report July 1973-August 1974, p III-1--III-3, (NASA CR-140601). NASA NGR 10-015-008.

Descriptors: *Water circulation, *Estuaries, *Lagoons, Winds, Florida, Currents(Water), Wind velocity.
Identifiers: Kennedy Space Center(Fla), Merritt Island(Fla), Haulover Canal(Fla).

The water movement in this lagoon system is essentially wind driven. Transport through Haulover Canal was measured as a function of water level difference at its ends and correlated with wind patterns. The small difference between surface and average current indicated an almost uniform profile. For current from Indian River to Mosquito Lagoon, optimal wind direction was southwest, and from Mosquito Lagoon to Indian River, due north. There was a close relation between local wind and surface current. When wind blew over the lagoon, a stationary vertical velocity profile was established in about 5 minutes; transport caused water pile-up against the shores; and a 'slope current' was formed by this water level difference. The time constant depended on water surface length in flow direction. For crosswinds, stationarity may be established in one hour; for lengthwise winds, stationarity may not occur in the time a given wind pattern is permanent. Wind set-up influences vertical current profile strength and may produce a direction variation of current with depth. Wind driven currents exist in shallow water. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01896

SEDIMENT ANALYSIS OF THE LAGOONAL COMPLEX SURROUNDING KSC (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
E. H. Kalajian.
In: A Study of Lagoonal and Estuarine Processes in the Area of Merritt Island Encompassing the Space Center, Annual Report July 1973-August 1974, p IV-1-IV5. 4 fig. (NASA CR-140601). NASA NGR 10-015-008.

Descriptors: *Lagoons, *Estuaries, *Bottom sediments, Florida, Sands, Silts, Cores, Carbon..
Identifiers: Kennedy Space Center(Fla), Merritt Island(Fla), Indian River(Fla), Mosquito Lagoon(Fla), Banana Creek(Fla).

Bottom sediments in the Indian River and Mosquito Lagoon areas, Florida, are predominately a fine sand with shell or trace of shell material. Variations with depth and shell layering or bonding occurred frequently in many of the cores. The effect of the burrowing of benthic organisms was often observed. Silt and silty sand occurred at certain locations at deeper water depths. The color of wet sediments ranged from very dark grey to olive. Organic carbon contents of bottom sediments ranged from 0 to 2.4%; the majority of the sediments had values less than 1%. These values compared with sediments of similar texture from other coastal locations. A few chemical stratigraphy studies were made, but no conclusions can be drawn at present. Equipment for testing the filtering aspects of sediments on hypergolic fuels is being set up. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01897

WATER QUALITY PARAMETERS OF THE LAGOONAL COMPLEX SURROUNDING KSC (KENNEDY SPACE CENTER),
Florida Inst. of Tech., Melbourne.
J. A. Lasater.
In: A Study of Lagoonal and Estuarine Processes in the Area of Merritt Island Encompassing the Space Center, Annual Report July 1973-August 1974, p V-1--V-15. 6 fig, 1 tab. (NASA CR-140601). NASA NGR 10-015-008.

Descriptors: *Water quality, *Lagoons, *Estuaries, Florida, Subtropic, Shallow waters, Rainfall, Evaporation, Sampling, Statistical methods, Temperature, Salinity, Hydrogen ion concentration, Dissolved oxygen, Nitrates, Phosphates, Turbidity.
Identifiers: *Kennedy Space Center(Fla), Merritt Island(Fla), Mosquito Lagoon(Fla), Indian River(Fla), Banana River(Fla).

Merritt Island is located on the east central Florida coast, at the apex of Indian River Lagoon (Mosquito Lagoon), the Indian River, and the Banana River, which comprise a classical lagoon complex of an estuarine character. Circulation and mixing processes are mostly winddriven with prevailing winds and those immediately preceding meteorological events contributing to the chemical concentrations of the water. Sanitary and storm effluents, water from land drainage projects, and rainfall are sources of fresh water. Evaporation rates are high. Prevailing winds are seasonally almost bidirectional, so there is net transport of winddriven water along the longitudinal SE to NW axis. For statistical evaluation, a sampling pattern was selected utilizing latitudinal-longitudinal coordinates of the area; sampling stations were established at the intersection of each minute of arc of latitude and longitude. Temperature, salinity, pH, dissolved oxygen, nitrate, phosphate, and turbidity for 1972 and 1973 were compared; while 1973 was more moist, the average values were within standard deviations for 1972. Differences observed for the same calendar periods for different years reflected prevailing meteorological conditions. There was general consistency in the statistical evaluations which should permit selection of a limited number of sampling stations for longterm studies. (See also W76-01893) (Buchanan-Davidson--Wisconsin)
W76-01898

COMPARATIVE DISCHARGES OF FRESH AND WASTE WATER ALONG THE CALIFORNIA COAST,
California Univ., Santa Cruz. Earth Sciences Board.
For primary bibliographic entry see Field 5B.
W76-01914

TOTAL MERCURY IN SOME FISH AND SHELLFISH ALONG THE MEXICAN COAST,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5C.
W76-01925

MARINE MEIOFAUNA OF A NEW YORK CITY BEACH WITH PARTICULAR REFERENCE TO TARDIGRADA,
City Coll., New York. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-01930

ABOVE GROUND PRODUCTION AND CHEMICAL ANALYSIS OF PHRAGMITES COMMUNIS IN POLLUTED BRACKISH WATER,
Stockholm Univ. (Sweden). Botany Inst.
For primary bibliographic entry see Field 5C.
W76-01943

ON THE INFLUENCE OF SEWAGE POLLUTION ON INSHORE BENTHIC COMMUNITIES IN THE SOUTH OF KIEL BAY. PART I. QUALITATIVE STUDIES ON INDICATOR SPECIES AND COMMUNITIES,
Kiel Univ., (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 5C.
W76-01944

REMARKS ON INDICATOR ORGANISMS (MEIOFAUNA) IN THE COASTAL WATERS OF THE GDR,
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
For primary bibliographic entry see Field 5B.
W76-01946

EFFECTS OF A SULPHATE PULP MILL ON THE BENTHIC MACROFAUNA IN A FIRTH OF THE BOTHNIAN SEA,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5C.
W76-01947

CHANGES IN PLANKTON RESULTING FROM EUTROPHICATION OF A BALTIC FIRTH,
Gdansk Univ. (Poland). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-01948

THE EFFECTS OF FERRY TRAFFIC ON ROCKY SHORE VEGETATION IN THE SOUTHERN ALAND ARCHIPELAGO,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-01949

THE EFFECTS OF FERRY TRAFFIC ON THE ROCKY SHORE MACROFAUNA IN THE SOUTHERN ALAND ARCHIPELAGO: I. THE CLADOPHORA ZONE,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-01950

ALGAL ZONATION ON ROCKY SHORES OUTSIDE HELSINKI AS A BASIS FOR POLLUTION MONITORING,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
For primary bibliographic entry see Field 5C.
W76-01951

CAN NEW YORK'S WETLANDS BE SAVED. A CONSTITUTIONAL AND COMMON LAW SOLUTION,
For primary bibliographic entry see Field 6E.
W76-01964

INTERNATIONAL STRAITS: THE RIGHT OF ACCESS,
Army Staff Judge Advocate's Office, Berlin (Germany).
For primary bibliographic entry see Field 6E.
W76-01965

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

GENERALIZED CRITERIA FOR VERIFICATION OF WATER DEVELOPED THROUGH WEATHER MODIFICATION,
Bittinger M. W. and Associates, Inc., Fort Collins, Colo.
E. B. Jones, C. F. Leaf, and W. H. Fischer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-124, $6.75 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 154 p, 26 fig, 21 tab, 119 ref, append. OWRT-C-4099(No. 9020) (1).

Descriptors: *Weather modification, *Water rights, Water supply, *Model studies, Water law, Colorado, Montana, New Mexico, Texas, Utah, Wyoming, *Legal aspects.
Identifiers: Developed water, Cold orographic situation, Warm season cumulus.

The filing of a water right based on water developed through weather modification appears to be possible in most of the States operating under the appropriation doctrine. The conditions under which this may be practical are considered. Interviews were conducted with selected water resources officials in the States of Colorado, Montana, New Mexico, Texas, Utah, and Wyoming. Based on their input and the use of existing hydrologic and meteorologic simulation models, general guidelines were prepared. An example for the cold orographic situation is included.
W76-01519

WEATHER MODIFICATION OPERATIONS IN CALIFORNIA, OCTOBER 1, 1972 - SEPTEMBER 30, 1973,
California State Dept. of Water Resources, Sacramento, Div. of Planning.
M. M. Schwartz, and M. W. Peyton.
Report, July 1975. 22 p, 11 fig, 12 tab, 2 plates.

Descriptors: *Weather modification, *Cloud seeding, *California, Permits, Regulation, Governments, Projects, Silver iodide, Artificial precipitation, Precipitation(Atmospheric), Rain, Snow, Meteorology.

Chapter 4 of the California Water Code, which governs the regulation of rain-making and rain-prevention, declares that the state shall encourage scientific efforts to develop, increase, and regulate the precipitation of rain and snow in California. Regulation and control of artificial means of interfering with natural precipitation are, by statute, the responsibility of the Department of Water Resources. Persons undertaking such work must be licensed by the department and, upon completion of their operations, must report the manner and extent of their efforts to the department. The report described weather modification efforts carried out in California from October 1, 1972, through september 30, 1973. Nine licensees engaged in 11 projects. All projects made use of silber iodide in various forms as the active agent to increase precipitation. Three projects used both ground-based and airborne generators, and eight used ground-based generators only. No information was available to enable the department to assess the results of these operations. Excerpts from the California Water Code that pertain to the administration of weather modification projects in the state were included. (Sims-ISWS)
W76-01530

ECONOMICS OF LAND LEVELING FOR DRYLAND GRAIN PRODUCTION,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-01692

CYCLIC STORAGE OF FRESH WATER IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. o Petroleum Engineering.
For primary bibliographic entry see Field 4B.
W76-01811

DEVELOPMENT OF ASPHALT CUSHIONED PLASTIC REINFORCED ASPHALT MEMBRANES FOR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, and R. A. Jiminez.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 553 $4.00 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 29 p, 16 fig, 2 tab, 8 re OWRT A-059-ARIZ(2). 14-31-0001-5003.

Descriptors: *Seepage control, *Water harvesting *Asphalt, Plastics, Barriers, Testing procedures Aggregates, Materials testing.
Identifiers: Catchments, Reservoir lining Seepage barriers.

This project was concerned with laboratory equipment development, laboratory testing, construction equipment development and field investigation of the APAC (Asphalt-Plastic-Chip-Coated water seepage barrier. The laboratory equipment that was designed and fabricated included hydrostatic testing vessels, slope stability apparatu and tensile testing grips. Three testing methods were utilized and evaluated. The first test method evaluated the hydrostatic puncture resistance the asphalt-polyethylene combination. The te confirmed the hypothesis that the asphalt effe tively increases the puncture resistance of th APAC membrane over that of the pla polyethylene. The second test investigated th slope stability of a protective APAC chip seal. typical 3/8 in. (9.5 mm) cover aggregate remains stable on constructed slopes of 3:1 and 4:1 and th 2:1 slope remained stable up to a surface temperature of 1220F (50C). The third test method evaluated adhesive materials and indicated that Pres tite mastic was the best suited adhesive for sealing polythylene overlaps. Subsequent field investigations resulted in equipment development that i creased construction efficiency in the installation of the APAC membrane. Actual completed fie installations were evaluated and further recommendations are included.
W76-01812

RADAR REFLECTIVITY FACTOR CALCULATIONS IN NUMERICAL CLOUD MODEL USING BULK PARAMETERIZATION OF PRECIPITATION,
South Dakota School of Mines and Technology Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 2B.
W76-01860

3C. Use Of Water Of Impaired Quality

EFFLUENT: THE FUTURE WATER SUPPLY,
For primary bibliographic entry see Field 5D.
W76-01644

3D. Conservation In Domestic and Municipal Use

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING BENEFITS OF PROTECTING URBAN FLOOD PLAINS,
Washington Univ., St. Louis, Mo., Inst. for Urban and Regional Studies.

rimary bibliographic entry see Field 6B.
01595

HINGTON'S WATERFRONT LESSON,
Carolina Univ. at Chapel Hill. Dept. of Fine

rimary bibliographic entry see Field 6B.
01596

MULATION OF WATER RATES FOR BAL-
RE COUNTY, MD.,
nore County Dept. of Public Works,
on, Md.
rimary bibliographic entry see Field 6C.
01608

ECASTING URBAN WATER USE: COM-
CIAL ESTABLISHMENTS,
land Univ., College Park. Dept. of Civil En-
ring.
rimary bibliographic entry see Field 6D.
01609

EFITS AND COST OF DRAINAGE
EMS,
ie Univ., Lafayette, Ind. Dept. of Agricul-
Economics.
rimary bibliographic entry see Field 6B.
01798

CHASTIC MODELS FOR GROUND
ER LEVELS,
ue Univ., Lafayette, Ind. Water Resources
arch Center.
rimary bibliographic entry see Field 4B.
01799

NOMICS OF WATER SUPPLY PLANNING
MANAGEMENT,
sylvania State Univ., University Park. Inst.
esearch on Land and Water Resources.
rimary bibliographic entry see Field 6B.
01802

Conservation In Industry

DUCTION OF SUPERHEATED STEAM
M VAPOR-DOMINATED GEOTHERMAL
ERVOIRS,
ogical Survey, Menlo Park, Calif.
. Truesdell, and D. E. White.
hermics (Italy), Vol 2, Nos 3 and 4, p 154-173,
ember-December, 1973. 7 fig, 5 tab, 56 ref.

riptors: *Geothermal studies, *Thermal
r, *Steam, *Energy transfer, Model studies,
surface investigations, Thermodynamic
vior, Energy, Heat flow, Methodology,
uation.
tifiers: *Geothermal systems, *Geothermal
rvoirs.

or-dominated geothermal systems such as
lerello, Italy, The Geysers, California, and
sukawa, Japan, yield dry or superheated steam
n exploited. Models for these systems are ex-
ed along with production data and the ther-
ynamic properties of water, steam, and rock.
se systems initially consist of a water and
m filled reservoir, a water-saturated cap rock,
a water or brine-saturated deep reservoir
w a water table. Most water in all parts of the
em is relatively immobilzed in small pores and
ices; steam dominates the large fractures and
s of the reservoir and is the continuous, pres-
-controlling phase. With production, the pres-
is lowered and the water boils, causing mas-
transfer of heat from the rock and its eventual
ng. Passage of steam through already dried
produces superheating. After an initial vaporization of water in the reservoir, the decrease in pressure produces increased boiling below the deep water table. With heavy exploitation, boiling extends deeper into hotter rock and the temperature of the steam increases. This model explains most features of the published production behavior of these systems and can be used to guide exploitation policies. (Woodard-USGS)
W76-01587

WATER CONSERVATION--AN ALTERNATIVE TO SOLVENT DYEING,
Sandoz Products Ltd., Leeds (England).
G. H. Lister.
Journal Society of Dyers and Colourists (G. B.), Vol 88, No 1, p 9-14, 1972. 5 tab, 4 ref.

Descriptors: *Water conservation, *Textiles, *Dyes, Industrial water.
Identifiers: Foam dyeing, Textile industry, Process modification.

To reduce the amount of water used and effluent produced during textile dyeing the dyeing process was conducted by foam. By converting small volumes of water into large volumes of microfoam in the subtrate body by adding a foaming agent to the dye liquor, even distribution of liquor was rapidly obtained. Subsequent heating fixed the dye to give level, well-penetrated color. The principle is also applicable to preparatory and finishing processes. Foam-forming properties and air-solution interfacial tensions of various foaming agents were determined. Even dye distribution was due to foam, not surface tension. Distribution time was an inverse function of the liquor: goods ratio and concentration of foaming agent. No exact mathematical relationship between liquor:goods ratio, foaming agent concentration, and mechanical force was established. Recipes for production of dyeings on various materials are given. Foam enabled application of dyes which cannot be applied by conventional means. Fixation problems occur because foam is a good heat insulator. Fluorescent brighteners can also be added with this technique. The process is technically and commercially viable. A system has been devised that uses only 2.5-5% of the water required for conventional dyeing processes. (Buchanan-Davidson--Wisconsin)
W76-01628

TREATING DYE WASTEWATER,
Cone Mills Corp., Greensboro, N.C.
For primary bibliographic entry see Field 5D.
W76-01629

CONSERVING OUR RESOURCES--THE CONTRIBUTION OF CHEMICAL TECHNOLOGY,
J. N. Smith.
Chemistry and Industry (G.B.), p 546-548, June 16, 1973. 1 fig, 2 tab.

Descriptors: *Water reuse, *Recirculated water, *Water conservation, *Sugar beets, Industrial water, Europe, Sludge.
Identifiers: England.

Water reuse techniques adopted by the best sugar industry in Britain reduce effluent from 1200 to 30 tons for every 100 tons of beets processed. Water is removed from beet pulp, then returned to the diffusers. Formaldehyde restricts bacterial activity on organic matter dissolved in circulating water. Transport water passes over screens to remove beet tails; muddy water goes to a thickener where water is decanted for reuse and the precipitated mud is pumped to settling ponds. Because of dissolved organic matter, lime is required to maintain neutrality and avoid corrosion. Water, needed to condense water evaporated during sugar crystallization, can be reused after cooling. Chlorine or hypochlorite is used to prevent growth of slime-forming organisms in recirculated water. Lime sludge is pumped without dilution. Separate water systems are used for turbine oil and alternator air cooling, washwater for beet analysis, and ash conveying. Clarified transport system water is used to wash carbon dioxide from the lime kiln and returned. Cooling of vacuum pumps, air compressors, and fluid couplings is often integrated into the condenser circulation system. Water reuse requires expenditure for the new plant and increased running costs. (Buchanan-Davidson--Wisconsin)
W76-01630

A SURVEY OF WASTEWATER TREATMENT TECHNIQUES FOR STEEL MILL EFFLUENTS,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 5D.
W76-01631

THE TREATMENT OF BLAST FURNACE GAS WASHING EFFLUENT,
British Steel Corp., Wolverhampton (England). Bilston Works.
For primary bibliographic entry see Field 5D.
W76-01633

TERTIARY TREATMENT OF PROCESS WATER,
American Oil Co., Whiting, Ind.
For primary bibliographic entry see Field 5D.
W76-01634

SOME EFFECTS OF METALS DISCHARGED IN EFFLUENTS AND POSSIBILITIES FOR THEIR RECOVERY,
Water Pollution Research Lab. Stevenage (England).
For primary bibliographic entry see Field 5D.
W76-01639

WASTE TREATMENT FOR THE PABST BREWERY AT PERRY, GEORGIA,
Wiedeman and Singleton, Atlanta, Ga.
For primary bibliographic entry see Field 5D.
W76-01640

LIMESTONE TREATMENT OF RINSE WATERS FROM HYDROCHLORIC ACID PICKLING OF STEEL,
Armco Environmental Engineering, Middletown, Ohio.
For primary bibliographic entry see Field 5D.
W76-01641

REMOVAL OF ZINC FROM PLATING RINSE WATER BY SIMPLE NEUTRALIZATION,
Dittmann (Carl) and Co., Karlsruhe (West Germany).
For primary bibliographic entry see Field 5D.
W76-01642

WASTES FROM THE MALTING AND BREWING INDUSTRY,
For primary bibliographic entry see Field 5D.
W76-01646

NEW WASTE WATER PRACTICES IN DAIRY PLANTS,
CREPACO, Inc., Chicago, Ill.
R. A. Elliott.
Journal of Milk and Food Technology, Vol 36, No 9, p 453-455, 1973, 3 fig.

Descriptors: *Water reuse, *Dairy industry, *Waste water treatment, Water conservation, Costs, Byproducts, Sludge disposal.
Identifiers: *Dairy wastes, *Cleaning operations, Process modification.

Recent water pollution legislation is requiring that the dairy industry reevaluate present operations in terms of reducing waste water. About 87% of the plants now dump waste water into municipal sewage systems, but increased treatment charges are demanding reevaluation of this method. The advantages and limitations of the cleaning-in-place and high-temperature-short-time systems are described. By proper system engineering, plant cleaning-in-place systems can be very efficient. Waste water loads, water, steam, and chemical composition can be greatly reduced. Plant recovery programs should be established to dispose of damaged or broken cartons and the product in cartons from filling areas. Conveyor lubricants should be used at low concentrations because they contain 25% hexane solubles. Sludge from separators or clarifiers should be collected and not be allowed to reach plant drains. Positive hose shut-offs should be installed to prevent excess amounts of water from going to the drain. Some plants may have to build their own waste treatment facilities. Traditional means of operating must be reevaluated. (Buchanan-Davidson--Wisconsin)
W76-01647

THE RECOVERY OF METALS FROM RINSE WATERS IN 'CHEMELEC' ELECTROLYTIC CELLS,
Electricity Council Research Centre, Capenhurst (England).
For primary bibliographic entry see Field 5D.
W76-01677

EVALUATION OF GEOTHERMAL ACTIVITY IN THE TRUCKEE MEADOWS, WASHOE COUNTY, NEVADA,
Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-01683

FACTORS AFFECTING SLIME ACCUMULATION IN FIBERBOARD MILL PROCESS WATER,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-01689

POSSIBLE IMPACTS OF OIL SHALE DEVELOPMENT ON LAND RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5C.
W76-01691

CIVIL ENGINEERING FEATURES OF GEOTHERMAL POWER PLANT,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 8C.
W76-01701

SALT RIVER PROJECT ANNUAL REPORT, 1974.
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 6B.
W76-01704

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ. Tucson. Div of Economic and Business Research.
For primary bibliographic entry see Field 6B.
W76-01709

ENERGY DEVELOPMENT IN THE ROCKY MOUNTAIN REGION: GOALS AND CONCERNS.
Federation of Rocky Mountain States, Inc. Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-01710

PURIFICATION OF INDUSTRIAL WASTE WATER,
Regie Nationale des Usines Renault, Paris (France); and Regie Nationale des Usines Peugeot, Paris (France).
For primary bibliographic entry see Field 5D.
W76-01721

REMOVAL OF CHROMIUM FROM PLATING RINSE WATER USING ACTIVATED CARBON,
Battelle, Columbus Lab., Ohio.
For primary bibliographic entry see Field 5D.
W76-01867

3F. Conservation In Agriculture

RELATIONSHIP OF CROP METABOLISM AND WATER STATUS TO IRRIGATION NEED,
Illinois Univ. at Urban-Champaign. Dept. of Botany; and Illinois Univ. at Urban-Champaign. Dept. of Agronomy.
S. Jurgens, R. R. Johnson, and J. S. Boyer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-105, $3.50 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 101, July 1975, 12 p, 2 fig, 1 tab, 6 ref. OWRT A-070-ILL(1). 14-31-0001-5013.

Descriptors: Irrigation, *Photosynthesis, Translocation, *Drought, *Crop production, Water utilization, *Metabolism, Irrigation efficiency, Corn(Field).

Irrigation represents the largest segment of consumptive water use in the U.S. Consequently, improvements in the efficiency of irrigation can have an important effect on the amount of water available for other uses. This research was initiated to determine the physiological limitations to crop yield during drought. The identification of these parameters may provide a way of estimating plant need for irrigation and avoiding unnecessary applications of water. Maize was grown to maturity, and photosynthesis and translocation of photosynthates were studied when drought occurred during grain development. Both carbon-14 labeling of the photosynthetic products and dry weight determinations indicated that net photosynthesis was substantially reduced whereas translocation was relatively rapid during drought. Furthermore, grain production occurred in proportion to the cumulative photosynthesis for the season. It was concluded that photosynthesis was more limiting than translocation to grain fill under dry conditions and that photosynthetic behavior could be used to reflect the need of maise crops for water.
W76-01512

SOYBEAN AND CORN ROOTING IN SOUTHWESTERN MINNESOTA: II. ROOT DISTRIBUTIONS AND RELATED WATER INFLOW,
Agricultural Research Service, Pendleton, Oreg.
For primary bibliographic entry see Field 2D.
W76-01528

THE DEVELOPMENT OF A CENTER PIVOT WASTEWATER IRRIGATION MACHINE,
Metropolitan Sanitary District of Greater Chicago. Ill.
For primary bibliographic entry see Field 5D.
W76-01565

TRICKLE IRRIGATION LATERAL DESIGN,
Texas A and M Univ., College Station Dept. of Agricultural Engineering.
T. A. Howell, and E. A. Hiler.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 5, p 902-90 September-October 1974. 5 fig, 2 tab.

Descriptors. *Irrigation design. *Hydrauli design, *Hydraulic properties, *Computer pr grams, Irrigation systems, Irrigation, Agricultur Design.
Identifiers: *Trickle irrigation, *Drip irrigation.

A design method for determining the pressure lo and emitter flow ratio for trickle irrigation later is presented. The design method is based up known principles of fluid mechanics. A compu program was written to determine the lateral pr sure loss and emitter flow ratio at a given desi length as a function of pipe size, tree spaci number of emitters per tree, emitter spaci downstream lateral pressure, and lateral slope. F a given set of design inputs, the program can used to determine if the given pipe size will adequate to limit the pressure loss and flow va tion along the lateral to limits acceptable for design lateral length. (Skogerboe-Colorado Stat
W76-01568

HISTORY OF IRRIGATION AND CHARA TERISTICS OF STREAMFLOW IN NORTHE NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4A.
W76-01589

SCIENTIFIC SYMPOSIUM ON DAIRY FLUENT TREATMENT,
For primary bibliographic entry see Field 5D.
W76-01632

ECONOMICS OF LAND LEVELING FOR D LAND GRAIN PRODUCTION,
Southwestern Great Plains Research Cen Bushland, Tex.
O. R. Jones, and J. L. Shipley.
Journal of Soil and Water Conservation, Vol No 4, p 177-181, July-August, 1975. 2 fig, 4 tab ref.

Descriptors: *Dry farming, *Semiarid clima *Bench leveling, *Terracing, *Crop product Agriculture, Farm management, Land form Erosion control, Land management, Water servation, Economics, Costs, Grain sorgh Wheat.
Identifiers: Bench terraces, Conservation b terraces, Land leveling systems.

Land leveling can increase the water availabl crop production by conserving runoff and the increasing dryland crop yields in a semiarid mate. Land leveling systems (bench terraces conservation bench terraces) were cropped in tinuous grain sorghum, and conservation b terrace watersheds were cropped in a w sorghum-fallow sequence. Conservation b terrace systems were more profitable than b terraces because land leveling costs were less land-leveling systems to be profitable, production must be increased sufficiently to an annual return on leveling construction c For continuously cropped grain sorghum probability of producing high yields (greater 2,000 pounds per acre) was 1 year in 2 on co vation bench terrace benches, 1 year in 4 on b terraces, and 1 year in 9 on sloping, unter plots. (Robinett-Arizona)
W76-01692

CONSERVATION OF SEDIMENT IN IRR TION RUNOFF,
Agricultural Research Service, Kimberly, I Snake River Conservation Research Center.

imary bibliographic entry see Field 4D.
01693

NDWATER MANAGEMENT AND NITY CONTROL: A CASE STUDY IN THWEST MEXICO,
Island Univ., Kingston. Dept. of Resource omics.
imary bibliographic entry see Field 4B.
01695

OTRANSPIRATION OF DRYLAND BAR- WITH DIFFERENT PLANT SPACING PAT- S,
rnia Univ., Riverside.
imary bibliographic entry see Field 2D.
01697

S OF HERBICIDES IN IRRIGATED COT-
ultural Research Service, Phoenix, Ariz.
Arle, and K. C. Hamilton.
Science, Vol 23, No 3, p 179-181, May, 5 tab, 7 ref.

riptors: *Herbicides, *Weed control, ation, *Cotton, Weeds, Plant groupings, growth, Crop production.
ifiers: Trifluralin, Diuron, Gossypium hirsu-.. Delta-pine 16.

levels of trifluralin and diuron were applied in populations of cotton (Gossypium hirsutum lta-pine 16). Compared to cultivation, all her- combinations improved weed control. Ap- ions of 0.28, 0.42, and 0.56 kilograms per hec- f trifluralin combined with 0.56 kilograms per re of diuron controlled annual weeds and ced the highest cotton yields. Herbicide ap- ions were more effective for weed control rop yield improvement than was crop spac- The 80 to 90 percent weed control achieved low rates of herbicide allowed some weeds to re seed and certain weeds could therefore in- e if this combination is used for more than 1 However, the use of lower rates in herbicide inations should reduce herbicide residuals in oil. (Robinett-Arizona)
01698

TH PLATTE RIVER FLOW CORRELA- NS,
rado State Univ., Fort Collins. Dept. of Civil neering.
primary bibliographic entry see Field 4A.
01699

IGN OF IRRIGATION RUNOFF OVERY SYSTEMS,
State Univ., Logan. Dept. of Agricultural rrigation Engineering.
. Stringham, and S. N. Hamad.
nal of the Irrigation and Drainage Division, rican Society of Civil Engineers, Vol 101, No p 209-219, September 1975. 2 fig, 5 ref, ap-

criptors: *Distribution systems, *Surface ir- ion, *Irrigation engineering, *Irrigation effi- cy, *Agricultural runoff, Furrow irrigation, Ir- ion systems, Irrigation design, Irrigation ation and maintenance, Irrigation water, er distribution(Applied), Runoff, Computer rams.
tifiers: *Irrigation Runoff Recovery Systems.

design of an Irrigation Runoff Recovery em is demonstrated; it eliminates the need for t-back type of irrigation by using a constant ly stream discharge, a constant discharge the recirculating pump, a constant furrow harge, and a constant number of furrows in set. This is accomplished by irrigating the entire first set from the inflow water and collecting the runoff in a storage reservoir. The remaining sets, except the last one, are irrigated by both the supply stream and the runoff water, recirculated by pump, and the last set is irrigated entirely by pumped runoff water. A technique is provided to determine the number of furrows to be irrigated from the supply and pumped streams, the number of sets and furrows in each set, the volume of storage required in the storage reservoir, and the recirculating pump flow rate. A Fortran IV computer program has been written that gives the system balance for incremented values of supply stream discharge and time of supply stream inflow. A copy of the complete computer program for the design process is available at cost from the writers, upon request. (Robinett-Arizona)
W76-01702

ANCHORING DEVICE FOR A FLEXIBLE SPRINKLER HOSE,
R. H. Kaatz.
U.S. Patent No 3,908,909, 5 p, 7 fig, 15 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2243, September 30, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Irrigation operation and maintenance, Equipment, Anchors.
Identifiers: Sprinkler hose.

This invention relates to improvements in anchoring devices for a flexible sprinkler hose. Such flexible sprinkler hoses are formed of a flexible material such as plastic and have rows of small perforations or holes along one side for emitting water in a multiplicity of fine streams along the length of the sprinkler hose. The sprinkler hose has a fitting at one end for connecting it to a water source and a fitting at the other end for closing the end of the sprinkler hose. This invention provides an anchoring device in which the anchor pin is swingable between an anchoring position extending transverse to the hose and a storage or transport position in which the anchor pin extends lengthwise of the hose. The anchoring device can be economically formed and easily applied to the flexible sprinkler hose. It is comprised of a one-piece body of resilient plastic material having an intermediate body portion adapted to underly the hose, an elongated anchor pin portion integrally connected at one end to the intermediate body portion by a thin flexible connector, and a hose engaging portion adapted to at least partially encircle the sprinkler hose. (Sinha-OEIS)
W76-01724

A FIELD STUDY ON THE RELATIONSHIP OF TEMPERATURE AND ICE TO INFILTRATION AT A SPRAY IRRIGATION FACILITY,
Michigan State Univ., East Lansing. Dept. of Civil and Sanitary Engineering.
For primary bibliographic entry see Field 2G.
W76-01810

IRRIGATION DEVELOPMENT COSTS AT THE FARM LEVEL.
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6B.
W76-01821

DESIGN AND USE OF CLOSED-TOP INFILTROMETERS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2G.
W76-01854

WATER USE, SEMINAR DAMASCUS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, 7-13 December 1971, Irrigation and Drainage Paper No 13, FAO, Rome, Italy, 1972. 312 p.

Descriptors: Irrigation practices, Irrigation efficiency, Farm management, Water requirements, Water management(Applied), Agriculture, Drainage, Foreign projects, Foreign countries, Foreign research, Crop production.

tThe main objective of the Water Use Seminar was to bring together senior government officials and experts from the Near East Region, and consultants and FAO officers to discuss and exchange information on their experience in the field of water management and water use in agriculture, specifically those aspects connected with increased effectiveness in water use at the farm level. The seminar was concerned with the determination of water requirements, water application and drainage, water control and management, scheme operation, and farmers' education and comprehension. This report should serve as reference material for those concerned with water use in agriculture in the Region. In view of the importance of experience, the different countries were requested to prepare contributions to each subject of the agenda of the seminar to reflect thei experience. These contributions are included in the technical report under the appropriate chapters. (See W76-01879 thru W76-01891)
W76-01878

THE ROLE OF EFFECTIVE IRRIGATION WATER MANAGEMENT AT THE FARMER'S FIELD,
Food and Agriculture Organization of the United Nations, Rome (Italy).
H. M. Horning.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 10-21, 2 fig, 4 tab.

Descriptors: *Irrigation practices, *Irrigation efficiency, *Farm management, *Water requirements, *Water management(Applied), Irrigation, Irrigation systems, Arable land, Irrigation design, Irrigation programs, Irrigation water, Water resources, Irrigation operation and maintenance, Water sources, Drainage, Irrigation effects, Fertilization, Timing, Water resources development, Planning, Water quality, Water loss, Costs, Agriculture.

In addition to the effective manipulation of soil moisture, proper management of irrigation and drainage also permits the provision of optimum conditions for fertilizer use, the introduction of highly responsive seeds and advanced tillage techniques and practices. The author suggests a new approach towards water development projects: The allocation of scarce water resources and planning of costly water development projects should no longer be based on empirical formulas; instead effective water use in agriculture calls for a new type of complex planning of water resources development in relation to the utilization of other resources, soil fertility, cropping pattern and crop returns. Key factors in water use planning including the amount of water needed, timing of water application, cropping schedules, water quality, and water losses are discussed. The costs of water development for agriculture are basically determined by water needs. The value of irrigation depends basically on the contribution it can make to reach a defined development objective and the effectiveness with which investments can be used. Returns from irrigation investments depend on the effectiveness with which irrigation is used by the

farmers and the know-how and experience of farmers in irrigation practices and modern agriculture. (See also W76-01878) (Robinett-Arizona)
W76-01879

WATER USE IN IRRIGATION PROJECTS IN THE SYRIAN ARAB REPUBLIC,
International Commission on Irrigation and Drainage, New Delhi (India); and Syrian National Committee.
N. Rifai.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No. 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 22-36, 2 fig, 9 tab, 3 ref.

Descriptors: *Irrigation programs, *Water requirements, *Water utilization, *Agriculture, *Water resources, Water sources, Water supply, Irrigation practices, Farm management, Water management(Applied), Irrigation, Irrigation water, Arable land, Drainage, Water quality, Water resources development, Arid lands, Irrigable land, Rainfall.
Identifiers: Syria.

Syria is situated in an arid or semiarid zone with large areas of arable and irrigable lands, with 70% of the population dependent on agriculture and agricultural industries for their living. A brief description is given of soils, precipitation, water resources, the population, irrigation projects, land and water use experimental farms, and water use in Syria. Problems concerning the effective use of water in Syria call for (1) study of the hydrological basins and water yield estimations, (2) a land and soil survey and classification, (3) studies on evaporation suppression, (4) increase in irrigation efficiency, (5) drainage studies, (6) study of various irrigation methods, (7) water quality investigations, (8) an increase in the number of agrometeorological stations, and (9) instruction of farmers on the value of making the best use of water in the field. (See also W76-01878) (Robinett-Arizona)
W76-01880

DETERMINATION OF WATER REQUIREMENTS IN IRRIGATION PROJECTS,
United Nations Development Program. Rome (Italy).
A. Marasovic.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 75-89, 4 fig, 6 tab, 14 ref, 2 append.

Descriptors: *Irrigation efficiency, *Water requirements, *Water supply, *Evapotranspiration, Irrigation practices, Water management(Applied), Irrigation, Irrigation programs, Agriculture, Water loss, Water resources, Water utilization, Crop production.
Identifiers: Water requirement estimation, Blaney-Criddle method.

When determining the necessary level of accuracy for crop water requirements, the various parameters determining the level of accuracy required need to be considered first. These parameters include the magnitude of the project (when the area is very large, accuracy may be low, and vice-versa), and water resources availability. This paper gives an analysis of the elements of the calculations of water requirements, and discusses the verification of the theoretical calculation. The value of experiments in the verification of theoretical calculations is also described. A long-term series method of determining water requirements for an irrigated area using the Blaney-Criddle formula is given. (See also W76-01878) (Robinett-Arizona)
W76-01881

WATER BALANCE STUDIES,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria). Div. of Atomic Energy in Food and Agriculture.
Y. Barrada.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 90-96, 10 ref.

Descriptors: *Water balance, *Evapotranspiration, *Lysimeters, *Soil water, *Hydraulic conductivity, Precipitation(Atmospheric), Runoff, Water conservation, Water loss, Infiltration, Consumptive use, Water requirements, Crop production, Irrigation, Irrigation water, Soil moisture, Drainage, Tensiometers, Nuclear moisture meters.
Identifiers: Thermocouple psychrometers, Soil water potential.

Studies of crop water use often involve the determination of all the components of the water balance equation: precipitation, irrigation, surface runoff, change in soil moisture storage, evapotranspiration, time, and drainage. The inputs precipitation, irrigation and surface runoff tend to be discrete in character and can be separately determined. Determination of evapotranspiration using lysimeters and the subsequent problems involved are discussed. Through drainage can be calculated if the relationship between hydraulic conductivity and water content, including the value at saturation, is known, the gradient in hydraulic potential is directly measured with tensiometers, and the soil moisture content is also known. The determination of hydraulic conductivity using tensiometers is described along with the thermocouple psychrometer method for measuring soil water potential and the use of the neutron moisture meter for measuring change in soil moisture storage. (See also W76-01878) (Robinett-Arizona)
W76-01882

RADIATION EQUIPMENT AND THE PRINCIPLES INVOLVED IN ITS USE,
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Atomic Energy Agency, Vienna (Austria), Div. of Atomic Energy in Food and Agriculture.
For primary bibliographic entry see Field 2G.
W76-01883

WATER REQUIREMENTS OF CROPS,
Soil Inst., Tehran (Iran).
H. Siadat.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 123-130, 8 tab.

Descriptors: *Water requirements, *Crop production, *Irrigation efficiency, *Soil moisture, *Meteorological data, *Irrigation practices, Plant growth, Water supply, Water resources, Arid lands, Rainfall, Lysimeters, Evapotranspiration, Water balance, Soil water, Soil moisture, Water conservation, Water loss, Consumptive use, Irrigation.
Identifiers: Penmen's equation, Blaney-Cridd formula, Turc's formula, Iran

This paper reports water requirements of cr growing in the arid to semiarid country of Ira which the average annual rainfall is 240 mm. M than 90 percent of the country receives insu cient precipitation. A summary is given of most economical water treatments for sugar b alfalfa, sunflower, and cotton, and yield of under different depths of submergence. author concludes that the most reliable method determination of crop water requirements is experimentation, although other methods such the use of lysimeters and meteorological data easier and quicker. Each method should be ployed for at least 3 to 4 years before the data tained can be used for practical purposes. most important aspect in field experiments is a rate and continuous determination of soil mois content during the growing season of cr Among the different meteorological formu Penman's equation was the most accurate, w the Blaney-Criddle or Turc equations were ea to use. (See also W76-01878) (Robinett-Arizona W76-01884

SURFACE IRRIGATION METHODS PRACTICES,
Food and Agriculture Organization of the U Nations, Cairo (Egypt). Near East Regional fice.
A. Arar.
In: Report of the FAO/UNDP Regional Sem on Effective Use of Irrigation Water at the Level, Damascus, Syria, December 7-13, 197 rigation and Drainage Paper No 13: Water Seminar, Damascus, Water Resources Development Service, Land and Water Dev ment Division, Food and Agriculture Organiz of the United Nations, Rome, 1972, p 149-1 tab, 11 ref.

Descriptors: *Irrigation practices, *Irrigation ciency, *Water requirements, *Surface irriga *Furrow irrigation. *Flood irrigation, W management(Applied), Irrigation, Irrig systems, Irrigation design, Irrigation w Economics, Water resources, Irrigation oper and maintenance, Drainage, Timing, Plan Agriculture, Crop production, Irrigation engi ing, Drainage systems, Drainage engineering.

Economical irrigation requires uniform applic of water at the proper time and proper amou good crop growth and prevention of soil salt mulation. Essentials in economizing the use rigation water are the correct selection o water application method in relation to given ditions and proper water management to a the best possible results from any adopted me No irrigation scheme should be consi without phased provision of drainage. Irriga leaching and drainage should be considered c tively in the overall plan for an area in order t tain maximum efficiency. The design of the i tion and drainage networks has to first mee requirements of agricultural production and cient water management at the field level. the design should start from the field leve should be based on correctly determined and tested parameters. A good knowledge of water requirements also is essential for eff water management. (See also W76-0 (Robinett-Arizona)
W76-01885

TECHNICAL ASPECTS OF WATER VEYANCE AND DISTRIBUTION SYSTEMS
Agricultural Univ., Wageningen, (Netherland
I. Nugteren.
In: Report of the FAO/UNDP Regional Se on Effective Use of Irrigation Water at the Level, Damascus, Syria, December 7-13, 19 rigation and Drainage Paper No 13: Wate Seminar, Damascus, Water Resources

opment Service, Land and Water Develop-
Division, Food and Agriculture Organization
United Nations, Rome, 1972, p 170-185, 2
ab.

iptors: *Irrigation practices, *Irrigation
ns, *Water management(Applied),
ibution systems, *Water requirements, Ir-
n efficiency, Farm management, Irrigation,
ion design, Irrigation programs, Irrigation
, Groundwater, Water resources, Water
es, Canals, Rainfall, Evapotranspiration,
g, Water resources development, Planning,
ulture, Crop production, Irrigation ditches,
conveyance, Water utilization, Water
.
fiers: *Field application efficiency.

vement of the contribution of irrigation to
production, together with increased
mic and technical efficiency of water utiliza-
can only be achieved by concentrating the
and operation of the system on the primary
se of supply and distribution: optimum field
ation. The long-term water requirement,
arized for the various crops and over the en-
ultivated area, forms the basis for determin-
e necessary supply and the adequacy of
ble resources. In order to evaluate the field
ation idea, it is necessary to briefly analyze
portant factors such as: rainfall, evapotrans-
n, and the field application efficiency. For
um utilization of the water resources it is
sary that complete control exist regarding
ne of availability for one of the resources. In
way a combination of surface water and
dwater supply can be used by having the
supply provided by river diversion, and the
ntal peak supply by groundwater. (See also
01878) (Robinett-Arizona)
01886

NT DEVELOPMENTS IN WATER DIS-
UTION AND APPLICATION WITH SPE-
REFERENCE TO SPRINKLER IRRIGA-
,
ersitaet Hohenheim (Landwirtschaftliche
schule) (West Germany). Dept. of Plant
uction in Tropical and Subtropical Countries.
chtnich.
eport of the FAO/UNDP Regional Seminar
ffective Use of Irrigation Water at the Farm
l, Damascus, Syria, December 7-13, 1971. Ir-
n and Drainage Paper No 13: Water Use
nar, Damascus, Water Resources and
lopment Service, Land and Water Develop-
Division, Food and Agriculture Organization
United Nations, Rome, 1972. p 186-210, 13
19 ref.

riptors: *Sprinkler irrigation, *Subsurface ir-
on, *Hydroponics, *Irrigation efficiency,
er requirements, *Irrigation systems, Irriga-
practices, Irrigation, Irrigation design, Irriga-
water, Salts, Water resources, Irrigation
ation and maintenance, Drainage, Irrigation
ts, Fertilization, Timing, Planning, Water
y, Agriculture, Arid lands, Root zone, Soil
ure, Soil-water-plant relationships,
graphies.
ifiers: *Drip irrigation.

kler irrigation may be regarded as the most
le system of irrigation applicable to most soil
opographic conditions and all kinds of crops.
system can be operated manually or automati-
and allows the precise application of water
rding to field capacity and infiltration rate.
ntages ofsprinkler irrigation are: (1) a
num of land grading and surface preparation;
e use of light sandy soils that do not allow
grading and are not suited for surface
ods due to texture and depth of root zone; (3)
omy in water application; (4) multipurpose
f the installation for water application, fertil-
nd pesticide distribution, control of microcli-
and frost protection; (5) little technical knowledge is necessary. Disadvantages include high cost of initial investment and maintenance, although there are less labor costs, and restricted use caused by strong erratic wind and poor quality water. Drip irrigation has many advantages, especially in arid agricultural regions with a limited quantity of irrigation water, and high rates of consumptive use. The ability to regulate the water supply to meet the requirements of the plant and to reduce air and surface evaporation results in reported savings in water up to 50 percent. The use of subirrigation systems and hydroponics is also discussed. (See also W76-01878) (Robinett-Arizona)
W76-01887

INVESTIGATIONS ON SURFACE IRRIGATION METHODS IN THE EUPHRATES BASIN,
United Nations Development Program, Rome (Italy).
I. Petrasovits.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 211-227, 7 fig, 6 tab, 10 ref.

Descriptors: *Irrigation systems, *Surface irrigation, *Furrow irrigation, *Border irrigation, *Irrigation design, *Furrow systems, Water management(Applied), Irrigation, Irrigation practices, Irrigation efficiency, Water requirements, Irrigation water, Timing, Planning, Agriculture, Crop production, Cotton, Soil moisture, Irrigation engineering, Consumptive use.
Identifiers: *Euphrates Basin, Billaneh experimental station.

An experiment was carried out in the summer of 1971 at the experimental station of Billaneh (Euphrates Basin) to collect data for the calculation of furrow irrigation parameters. The average daily water consumption of cotton, with 15% losses, was 8-10 mm in the period of peak water requirements. For an irrigation of 60 mm, the best results were obtained using a furrow length of 50 m with a 1.0-1.2 liter/second water flow; and for an irrigation of 80 mm, best results were obtained using a length of 100 m or more and a water flow greater than 1.2 liter/second. A practical method is given for the choice of parameters for furrow irrigation using tables which correlate these parameters with agronomic and hydraulic requirements for irrigation. Experiments carried out for border strip irrigation showed that the method requires a slope of 0.5-1 percent and good microlevelling. The choice of parameters for border strip irrigation also depends on permeability of the soil, the vegetal cover, and the direction of the sowing lines. (See also W76-01878) (Robinett-Arizona)
W76-01888

IRRIGATION ORGANIZATIONS,
Food and Agriculture Organization of the United Nations, Rome (Italy).
J. A. Sagardoy.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 254-266, 13 ref.

Descriptors: *Water management(Applied), *Irrigation programs, *Farm management, *Administrative agencies, *Irrigation water, Irrigation practices, Water allocation(Policy), Legal aspects, Planning, Water control, Water requirements, Water utilization, Irrigation, Agriculture, Governments, Water resources development, Water rights, Economics.

Water development projects for agriculture should be planned in such a way as to ensure the most effective use of water at the farmer's field. The organization and management of the schemes must be able to enforce effective water use throughout the scheme and include the technical, socio-economic, administrative and educational requirements of water management at the scheme and farm levels. This paper discusses the different ways in which the operation and management of irrigation schemes can be organized and the tasks which irrigation should fulfill: national laws should clearly define water and land rights, farmers' rights to the resources, farmers' participation and government's obligations; one single body should be responsible for the management of the system and properly coordinated with the regional, basin-wide and national organizations in charge of water administration in the country; irrigation schemes must by dynamic and change with time; and the government's control and supervision of water use should be established on a legal basis. (See also W76-01878) (Robinett-Arizona)
W76-01889

TRAINING AND EXTENSION FOR EFFECTIVE USE OF IRRIGATION WATER,
Food and Agriculture Organization of the United Nations, Rome (Italy).
W. D. Maalouf.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 267-276.

Descriptors: *Farm management, *Water management(Applied), *Irrigation programs, *Training, *Irrigation efficiency, Administrative agencies, Irrigation practices, Planning, Water control, Water utilization, Irrigation, Agriculture, Governments, Water resources, Economics, Irrigation water, Irrigation efficiency, Water sources, Crop production.

Modern irrigation requires a farmer who is equipped with needed technical skills who can provide and adequately use farm inputs and apply suitable methods of farm management. This paper deals with the need of farmers' training to insure an effective use of irrigation water which is considered the main element in any effort to improve agricultural production. Training of this nature requires, in each country, a well organized advisory system equipped with competent technical and educational staff. This system should provide for close collaboration between technical, educational, and service agencies (such as Agricultural Extension, Research, Education, Cooperatives, and Credits) who assist farmers with technical information and provide them with needed production inputs and marketing facilities. (See also W76-01878) (Robinett-Arizona)
W76-01890

NEAR EAST APPLIED RESEARCH PROGRAMME FOR LAND AND WATER DEVELOPMENT,
Food and Agriculture Organization of the United Nations, Cairo (Egypt). Near East Regional Office.
L. T. Kadry.
In: Report of the FAO/UNDP Regional Seminar on Effective Use of Irrigation Water at the Farm Level, Damascus, Syria, December 7-13, 1971. Irrigation and Drainage Paper No 13: Water Use Seminar, Damascus, Water Resources and Development Service, Land and Water Development Division, Food and Agriculture Organization of the United Nations, Rome, 1972. p 277-284.

Descriptors: *Water management(Applied), *Irrigation programs, *Arid lands, *Water resources development, *Research and development, Water requirements, Water supply, Arable land, Irrigation water, Water resources, Water sources, Agriculture, Planning, Farm management, Training, Administrative agencies, Water utilization, Irrigation, Governments, Foreign research, Land development, Saline soils.
Identifiers: *Near East countries.

Research is necessary for the inventory of water supply and distribution with particular reference to identifying its source, quality, rate and site of the flow, in addition to relating the water characteristics and parameters with those of the soil and in assessing the outcome of their interaction and their interrelation with the other sectors of the agriculture environment. In the semi-arid and arid areas which occur in almost all the Near Eastern countries, the provision of irrigation water and its economic use are two of the most important factors for increasing agricultural production. The majority of countries in the region need experienced manpower in all phases of the reclamation, improvement and management of salt affected and waterlogged soils, water management and control, and land preparation and related mechanized practices. A regional applied research program for land and water development is discussed considering the major benefits which could accrue to all governments from the proposed solutions and recommendations by the program. The program is designed to activate the existing institutional and manpower resources available for research in the countries concerned and seeks to guide and link their efforts, to help overcome organizational and other constraints and to promote training and extension services. (See also W76-01878) (Robinett-Arizona)
W76-01891

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

HIERACHICAL MANAGEMENT OF GROUND AND SURFACE WATER SYSTEM VIA MULTICELL APPROACH,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
Y. Y. Haimes.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-100, $8.00 in paper copy and $2.25 in microfiche. Ohio Water Reserve Center, Columbus, Interim Report, July 1975, 228 p, 25 fig, 40 tab, 44 ref. OWRT B-062-OHIO(1).

Descriptors: *Groundwater, Management, *Aquifer, Surface water, *Mathematical models, System analysis, Water supply, Water table, *Simulation analysis, *Model studies, *Ohio.
Identifiers: *Multicell system, Surrogate Worth Trade-Off Method, Sensitivity analysis, Parameter identification, Great Miami River Valley, Miami Conservancy District(Ohio), Fairfield-New Baltimore Area(Ohio), Hierarchical management.

A multicell groundwater simulation model was constructed to use the decomposition techniques for better data utilization, and then modified for the large scale, complex groundwater system. The model was applied to the case study, at Fairfield-New Baltimore area, Dayton, Ohio, and the sensitivity analysis of the model for evaluating the various approaches to the parameter identification problems was discussed. The problem of conjunctive use of ground, surface and other water resources systems was addressed. The complexity of the model was dealt with by using hierarchies of functions to relate various system responses to imposed input. Numerically the model could be solved provided those functions were made available by using a hierarchy of aquifer simulation models, resulting in a quadratic program and coordination scheme as a solution procedure. Next the model was applied to the case study, again the Fairfield-New Baltimore area. The scope of model testing was limited by the actual status of the area under study, but even so the potential applications of the developed model were well illustrated. An example problem was formulated and successfully solved where the conjunctive use of groundwater, streams and a surface reservoir was considered. The study was completed by introducing a multiobjective analysis to that same area. At least three noncommensurable objectives could be identified for water use: (1) minimize cost of water supply, (2) minimize environmental damage caused by lowering stream water level, (3) minimize future energy dependence of water supply. (Chao-Ohio State)
W76-01501

RELATIONSHIPS OF LOW, AVERAGE AND FLOOD FLOWS FOR STREAMS IN THE PACIFIC NORTHWEST,
Washington State Univ., Dept. of Civil and Environmental Engineering. Pullman.
For primary bibliographic entry see Field 2E.
W76-01507

A SIMULATION APPROACH TO THE ANALYSIS OF UNCERTAINTY IN PUBLIC WATER RESOURCES PROJECTS,
Georgia Univ., Athens, Inst. of Natural Resources.
For primary bibliographic entry see Field 6B.
W76-01510

PLANNING FOR COASTAL RECREATION OPPORTUNITIES NEAR LARGE URBAN AREAS: A STUDY RELATING TRANSPORTATION AND RECREATION,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W76-01516

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SIXTH VOLUME.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 6A.
W76-01517

AMES RESERVOIR ENVIRONMENTAL STUDY, SUMMARY REPORT.
Iowa State Water Resources Research Inst., Ames.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 144, $12.50 in paper copy, $2.25 in microfiche. ISWRRI Completion Report No 60-SR, (University of Iowa Final Report Series No 9-SR), 1973, 433 p. OWRT A-999-IA(8).

Descriptors: *Iowa, Reservoirs, Environment, *Environmental effects, *Pre-impoundment, *Reservoir sites, *Baseline studies, *Evaluation, Social aspects, Economic impact, Recreation, Water pollution control, Urbanization, Agriculture, Flood control, *Alternative planning, Discount rates, Decision making.
Identifiers: *Ames Reservoir(Iowa), Sensitivity analysis.

This is an environmental resources review study of the proposed Ames Reservoir, Skunk River, Iowa - including the valley's natural resources, agricultural and urban growth, people and their attitudes, recreation needs, water use and pollution control, flood problems, economic values, and impact of alternative development patterns. Ident cation of the resource uniqueness of the reser site and an evaluation of the environme responses anticipated under alternative devel ment patterns were major objectives of the stu Five major categories were used in conducting study: (1) Natural and archaeological resource the valley, reservoir site, and stream system social and economic impact; (3) outdoor recrea and open-space uses; (4) agricultural influe and effects; and (5) urban influences and eff The detailed project evaluation was condu using a sensitivity analysis and new w resources criteria adopted nationally in 1972 early 1973, or proposed for adoption. Disc rates for economic analysis of 3-1/4, 5-1/2, an were used, and variations in flood frequ methods, population growth rates, and var needs for recreation, water supply, and water lution control were introduced to provide an a of results. The environmental impact of all alt tives is presented in the summary report in a panded array presentation. The results of th vironmental review study will serve as a bas future decision-making. (See also W74-1 W74-11586, W74-11605, W74-11614 and 11623.)
W76-01522

ESTIMATION OF URBAN STORMWA QUALITY IN KALIHI STREAM DRAIN BASIN, OAHU, HAWAII,
Hawaii Univ., Honolulu, Water Reso Research Center.
For primary bibliographic entry see Field 5B.
W76-01525

HIGH-PRESSURE WATER JET CLEANIN SUBSURFACE DRAINS,
Agricultural Research Service, Brawley, Cali perial Valley Conservation Research Center.
For primary bibliographic entry see Field 8C.
W76-01564

USE OF DRAINAGE WELLS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 4B
W76-01566

LOW PRESSURE JET CLEANING OF PL DRAINS IN SANDY SOIL,
Agricultural Research and Education C Lake Alfred, Fla.
For primary bibliographic entry see Field 8B
W76-01569

HYDROLOGIC UNIT MAP--1974, STAT WISCONSIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C
W76-01571

HYDROLOGIC UNIT MAP--1974, STAT HAWAII.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C
W76-01572

HYDROLOGIC UNIT MAP--1974, STAT GEORGIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C
W76-01573

HYDROLOGIC UNIT MAP--1974, STATE LINOIS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C
W76-01574

ITY OF SURFACE WATERS OF THE ED STATES, 1969: PART 3. OHIO RIVER N.
gical Survey, Reston, Va.
imary bibliographic entry see Field 2K.
01577

LLITE RELAY AND PROCESSING OF ROLOGIC DATA IN SOUTH FLORIDA,
gical Survey, Tallahassee, Fla.
imary bibliographic entry see Field 7B.
01578

ES OF OREGON: VOLUME 3. HOOD R, MULTNOMAH, WASHINGTON, AND HILL COUNTIES,
gical Survey, Portland, Oreg.
imary bibliographic entry see Field 2H.
01579

SHOWING FLOOD OF APRIL 1975 AT IDIAN TOWNSHIP, MICHIGAN,
gical Survey, Lansing, Mich.
imary bibliographic entry see Field 7C.
01584

ORY OF IRRIGATION AND CHARAC-STICS OF STREAMFLOW IN NORTHERN RASKA,
gical Survey, Lincoln, Nebr.
Shaffer.
-file report 7501, September 1975. 15 fig.

riptors: *Water resources, *Surface waters, amflow, *Hydrologic data, *Nebraska, taries, Missouri River, River basins, Gaging ns, Flow characteristics, Water utilization, tion programs, Irrigation wells, Statistical ods, Flow rates, Probability.
ifiers: *White River, *Ponca River, brara River, *Bazile Creek.

streams drain the northern part of Nebraska are tributaries to the Missouri River above ton, S. Dak. Statistical data are presented for aging sites on White River, Ponca Creek, rara River, and Bazile Creek. The fifth m, Hat Creek, drains a small area in the ex- e northwest corner of the State. Only the ription of that basin is included. Streamflow rds have been computed from data that sent 1974 conditions of development and r use. Two major irrigation projects have constructed in the Niobrara River basin since g of streamflow began; therefore the plete record of water discharge at some gaging ns includes periods before and after stream- was affected by diversions to upstream pro- . The Whitney Irrigation Project was in opera- on the White River before streamflow records obtained. (Woodard-USGS)
-01589

RATIONAL SYSTEMS FOR SNOW MOVAL AND ICE CONTROL: A KGROUND/RESOURCE PAPER FOR THE ER GREAT LAKES UNIVERSITY CONSOR-M FOR TRANSPORTATION RESEARCH,
higan Technological Univ., Houghton, Mich.
. Huang.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as PB-238 935, 0 in paper copy, $2.25 in microfiche. Final re- , August 31, 1973. 6 p, 4 fig, 3 tab, 172 ref. T-OS-30096.

criptors: *Operation and maintenance, *Snow, ow removal, *Ice, *Deicers, *Transportation, hways, Airports, Equipment, Ice-brine ems, *Highway icing, Great Lakes, Snow- s, Michigan, Wisconsin, Minnesota.
tifiers: Snow vehicles, Snow removal ems, Upper Great Lakes Region, Drift con- Chloride salts.

There is a pacuity of research to date on operational systems for snow removal and ice control in the transportation systems in the United States and elsewhere. Though the primary interest of the author is the Upper Great Lakes Region including Minnesota, northern Wisconsin, and Michigan, he indicates that some of the proposed research could apply in other areas. Total expenditures in 1964 were around $200 million on snow and ice control. Research could result in substantial savings as well as increased safety and efficiency of roads. Intermediate objectives are listed: (1) Properties of snow and ice pertinent to removal and control operations must be determined. The major properties are understood and in Japan a classification system dividing snow and ice into 7 groups is used, but this system is not used now as a criterion for snow and ice removal; (2) Performance and efficiency criteria for various types of commonly used equipment need to be established; (3) Effectiveness of chloride salts as well as their social and environmental impacts must be re-evaluated. At present many aspects remain unknown. There are indications that some use of salts can cause rather than correct some dangerous road conditions; (4) The snowdrifting process should be understood under different geomorphological and climatic conditions. Field experiments are necessary under operational conditions; and (5) Models and techniques for the analysis of operational systems for maximum effectiveness of snow removal and ice control must be developed. Organization and training factors have been studied as has the location of maintenance stations, but much more needs to be done in these and related areas. (Smith-North Carolina)
W76-01591

THE RIVER'S REACH: AN ASSESSMENT OF EXISTING FLOOD PROTECTION IN UPSTREAM WATERSHEDS OF THE CONNECTICUT RIVER BASIN.
Soil Conservation Service, Durham, N.H.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 499, $5.00 in paper copy, $2.25 in microfiche. Prepared for New England River Basins Commission. Supplemental study, March, 1974. 68 p, 13 fig, 6 plates, 26 tab, append. CRSS-SCS 1.1D, 1.3D, 1.3E, 1.4D.

Descriptors: Floods, Flooding, Flood flow, *Flood forecasting, *Flood damage, *Watersheds(Basins), *Flood plains, *Connecticut River, *Flood protection, *Vermont, Streamflow forecasting, Flood data, Flood frequency, Peak discharge, Stage-discharge relations, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Land use, Dikes, Dams, Channel improvement.
Identifiers: Connecticut River Basin(Vt), Passumpsic River(Vt), Whetstone Brook Watershed(Vt), Mill River(Vt), Moose River(Vt), Lyndon(Vt), St Johnsbury(Vt), Battleboro(Vt), Marlboro(Vt), Northampton(Vt), Williamsburg(Vt).

Three watersheds in the Connecticut River Basin were studied to assess existing flood protection and to estimate damages for floods of varying magnitudes. The Passumpsic River Watershed (Vt.) drains 374 square miles and includes the Moose River. Flood damage has occurred 17 times in 150 years, the greatest flood, in 1927, causing $8,927,000 in damages. Development in the flood plain is 32% agriculture, 52% woodland and wetland, 4% urban and 12% miscellaneous. Future flood estimates range from $474,000 in a 10-year flood to $7,510,000 in a 100-year flood. Average annual damage is predicted at $539,200. Lyndon (Vt.) and St. Johnsbury (Vt.) in this watershed both have flood plain zoning ordinances, but existing flood plain development is unprotected. Land use in the Whetstone Brook Watershed (Vt.) is 62% urban, 19% agriculture and 19% miscellaneous. The 1938 flood damages were estimated at $2,887,000. Future flood damage estimates range from $155,000 in a 10-year flood to $3,237,000 in a 100-year flood. Predicted annual damage is $226,800. The town of Battleboro (Vt.) uses state and local regulations to control flood plain development. Marlboro (Vt.) has a flood plain zoning ordinance. The Mill River Watershed drains 59 square miles and land use is 24% agriculture, 20% urban, 44% wetland and woodland, and 12% recreation. The 1938 flood damages were about $860,000 and future damages range from zero in the 10-year flood to $1,135,000 in a 100-year flood. Northampton (Vt.) has a flood management plan, proposed zoning, and a dike and diversion system. Williamsburg (Vt.) is planning control of flood plain use. This report analyses the watersheds in detail and gives many kinds of flood plain protection alternatives. (Smith-North Carolina)
W76-01592

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING BENEFITS OF PROTECTING URBAN FLOOD PLAINS,
Washington Univ., St. Louis, Mo., Inst. for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W76-01595

CONVENTIONAL WISDOM PLUS A NEW PHILOSOPHY--CORPS OF ENGINEERS WATER RESOURCE PLANNING,
For primary bibliographic entry see Field 6E.
W76-01598

FLOOD MANAGEMENT DECISIONMAKING IN THE CONNECTICUT RIVER BASIN: ANALYSIS OF THE EXISTING LEGAL, FINANCIAL AND INSTITUTIONAL FRAMEWORK FOR FLOOD PLAIN MANAGEMENT,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6F.
W76-01599

OPTIMAL PRICING AND INVESTMENT IN COMMUNITY WATER SUPPLY,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 6C.
W76-01600

THE CONCEPT OF WATER RESOURCES DEVELOPMENT,
Central Water and Power Commission, New Delhi (India).
For primary bibliographic entry see Field 6B.
W76-01618

INSTITUTIONAL BEHAVIOR CONCERNING RIVER BASIN MANAGEMENT LEGISLATION,
Doane Coll. Crete, Nebr.
For primary bibliographic entry see Field 6E.
W76-01682

A SCHEME FOR STOCHASTIC STATE VARIABLE WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-01685

SOUTH PLATTE RIVER FLOW CORRELATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. E. Glover.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR 3, p 175-186, September, 1975. 3 fig, 3 tab, 15 ref, 1 append.

Descriptors: *Planning, *Water management(Applied), *Surface-groundwater relationships, *Watersheds(Basins), *Diversion, *Water balance, Streamflow, River flow, Safe yield, *Colorado, Irrigation, Groundwater basins, Hydrogeology, Water table, Water sources, Groundwater, Pumping, Water utilization, Withdrawal, Water resources.
Identifiers: *South Platte River(Colo).

A study was done on the South Platte River in Colorado in order to determine necessary management of the water resources of the valley with respect to water diversions for irrigation and pumping from the valley. A technically sound computation procedure has been developed in order to determine advance quantitative knowledge of what the effect of water resource decisions will be. The equations have been reduced to tabular form and the validity of the computation has been confirmed by testing it against the historic performance of the river. Depletion of the river due to pumping was found to approximate one-fifth of the watershed yield. Computations indicate that the response of river flow to shutting down of wells will be so sluggish that attempts to put wells directly into the priority system will be both ineffective and dangerous. It is concluded that the surface waters and groundwaters of the valley are one water supply since no acceptable flow correlations can be obtained until the return flows to the river from groundwater are accounted for. (Robinett-Arizona)
W76-01699

SUMMARY OF 1975 ROCKY MOUNTAIN LAND USE AND NATURAL RESOURCE BILLS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
For primary bibliographic entry see Field 6E.
W76-01711

THE ROCKY MOUNTAIN REGION: A UNITY OF INTERESTS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-01712

BAYESIAN INFERENCE AND DECISION MAKING FOR EXTREME HYDROLOGIC EVENTS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
E. F. Wood, and I. Rodriguez-Iturbe.
Water Resources Research, Vol 11, No 4, p 533-542, August, 1975. 11 fig, 3 tab, 15 ref.

Descriptors: *Hydrologic aspects, *Mathematical models, *Flood forecasting, Statistical models, Cost analysis, *Decision making, Engineering.
Identifiers: *Bayesian inference, Cost-benefit analysis.

An analysis of parameter uncertainty and the effects of model uncertainty upon decision making, as applied to flood prediction, is discussed. It is argued that the decision theory approach to making decisions is a more rational approach than other procedures which separate inferences, decisions, and preferences. A case study was presented for the determination of the best level of flood protection for Woonsocket, Rhode Island. Each of three probability models was compared, and the Bayesian procedure was employed. Prior data from a regional regression model, historical data, and realistic flood cost and damage functions were used. A calculation was made of the composite Bayesian distribution of flood discharges, which was then used in conjunction with an appropriate utility function to maximize expected utility and net benefits. The results of the Rhode Island study confirmed the expectation that Bayesian statistical procedures could be used to make engineering decisions. (Kramer-FIRL)
W76-01761

MATHEMATICAL MODEL FOR ESTABLISHING THE OVERFLOW SPILLWAY DISCHARGES IN THE FLOOD STORAGE PONDS,
Academia de Studii Economics, Bucharest (Rumania). Dept. of Economic Cybernetics.
V. Ionescu, D. Chebeleu, and U. Berar.
Economic Computation and Economic Cybernetics Studies and Research, No 2, p 71-79, 1975. 3 fig, 2 tab.

Descriptors: *Overflow, *Storm runoff, *Floods, *Mathematical models, Computers, Economics, Storage.
Identifiers: Transylvania.

Equations are presented for the establishment of overflow spillway discharges in storm water retention basins. Overflow spillway discharge is dependent upon the two variables base and height of the spillway wave, which can be modified so that they correspond to an economic minimum. A network of water storage basins is being designed for the most economical system of flood attenuation for the area of the Transylvanian high plains. The amount of overflow spillway discharge was determined by a mathematical model using a calculus program to optimize the economic solution. The scheme has been integrated into a computer program and its details are graphically illustrated. (Kramer-FIRL)
W76-01762

EFFECT OF VALLEY SHAPE ON RETENTION BASIN PERFORMANCE,
A. R. Pagan.
Public Works, Vol 106, No 8, p 84-85, August, 1975. 4 fig, 1 tab.

Descriptors: *Flood control, *Retention, Outflow, Mathematical models, *Reservoirs, *Storage capacity, Hydrographs, Engineering.

A mathematical model was designed to emphasize the importance of the cross-section profile of the valley behind a flood control structure for engineers responsible for selecting storage reservoir sites. Because the amount of storage available should increase as rapidly as possible with increasing depth in order to get the greatest amount of outflow reduction, a U-shaped valley was suggested to be much more effective in suppressing flood peaks than a V-shaped valley. In order to quantify this, an imaginary stream was assumed as well as an outflow versus depth hydrograph. The following curves were used: inflow hydrograph (same for both V-shaped and U-shaped valleys); storage versus depth curve for V-shaped valley; storage versus depth curve for U-shaped valley; and outflow versus depth curve. From these were constructed storage versus outflow curves for V-shaped and U-shaped valleys and $2S/t + 0$ versus outflow curves for V-shaped and U-shaped valleys. When all these curves were plotted, the standard routing procedure was followed and the resulting outflow hydrographs for each valley shapes were compared. It was determined that the peak outflow for the V-shaped valley was 330 cfs and for the U-shaped valley 245 cfs. The percentage of peak inflow was 36.7 for the V-shaped valley and 27.2 for the U-shaped one. Peak storage capacities were 2.25 million cu ft and 2.95 million cu ft, respectively. A greater amount of land might be needed with less advantage for the less efficient V-shaped storage reservoir. Additionally, the routed peak outflow of the U-shaped valley was 74 percent of that of the V-shaped valley. (Kramer-FIRL)
W76-01773

LONG-TERM FLOOD PREDICTION FROM SHORT-TERM RIVER DATA.
Search, Vol 6, No 7, p 250-251, July, 1975.

Descriptors: *Flood forecasting, *Rainfall-runoff relationships, *Australia, Rainfall, Mathematical models, Statistical models, Streamflow.

The problem of flood forecasting in Australia w
discussed at the Institute of Engineers Hydrolo
Symposium at Armidale In the Queensland ar
streamflow records have only been kept for
past ten years. Because of this, accurate pred
tion of larger, less frequent floods are not feasi
by direct methods. However, the Queensland
rigation and Water Supply Commission
developed an indirect method to give useful lo
term flood forecasts. It was found that ann
flood maxima in a catchment have a very cl
statistical relationship with daily runoff volum
the same catchment. Rainfall records have b
kept for a much longer time than streamf
records. Daily runoff volume correlates with r
fall. The rainfall/runoff relationship belongs t
common family of curves, which can be c
sidered in terms of the parameter K2. The
value was demonstrated to be useful in obtai
long-term flood predictions from long-term rai
records. The method was checked for e
catchments for which about of 30 years
complete records were available. The maxim
one-in-fifty years and one-in-one hundred y
floods were predicted, and the predictions w
compared with those made conventionally f
the full flood record. The differences between
two predictions (on the average) was less t
eight percent. Thus, it may be possible to m
reasonably accurate predictions for o
catchments with only rainfall data. (Kra
FIRL)
W76-01776

**DENVER SEEKS TOMORROW'S WA
TODAY,**
Parsons, Brinckerhoff, Quade and Douglas,
New York.
H. Michel, and G. Oliger.
Water and Wastes Engineering, Vol 12, No 8,
35, August, 1975. 2 fig.

Descriptors: *Computer models, *Water ri
*Water resources, Geological surveys, Envi
mental effects, Streamflow, Cost anal
Colorado River, Colorado.
Identifiers: *Denver(Colo), Eagle River, P
River, Hydrologic study, Operational study.

The Denver Board of Water Commissioners'
to develop economically and environmen
sound water sources for the future, using
Eagle, Piney, and Colorado Rivers, are discus
Four major tasks were required: a hydro
study; a geological survey; an environm
evaluation; and an operational study. The limi
taking water out of a river forced three consi
tions: existing water rights; streamflow ch
teristics; and how the water rights effect the
at selected points on the stream. Analyzing th
ercising of a combination of the existing
rights was a complex task, and, hence, requi
computer simulation model. The model sel
has been used successfully on other Colo
river projects. The configurations obtained
this method were checked against a geological
vey and their environmental impact was
sidered. The geological survey eliminated so
the configuration choices. After this analysis,
configurations were selected for more de
analyses. An operational study was then
dertaken, along with a cost analysis to choos
best configuration from these four. Another
puter simulation model was used for these st
It was found that the Eagle-Piney/Eagle-Colo
configuration had the greatest firm annual del
and the lowest unit cost. (Pinto-FIRL)
W76-01779

**LOCAL LAND USE CONTROL OVER C
CAL AREAS,**
American Society of Planning Officials, Chi
Ill.
For primary bibliographic entry see Field 6E.
W76-01790

IONAL INSTREAM FLOW NEEDS IN THE IFIC NORTHWEST: A ANALYSIS OF IN-TUTIONAL, LEGAL, AND TECHNOLOGI-ASPECTS OF ALLOCATION PROCESSES LIMITED STREAMFLOW,
hington State Water Research Center, Pull-
primary bibliographic entry see Field 6B.
-01797

EFITS AND COST OF DRAINAGE TEMS,
lue Univ., Lafayette, Ind. Dept. of Agricul-l Economics.
primary bibliographic entry see Field 6B.
-01798

PACITY OF WATER-BASED RECREATION TEMS, PART III: METHODOLOGY AND DINGS,
th Carolina State Univ., Raleigh. Dept. of reation Resources Administration.
primary bibliographic entry see Field 6B.
-01804

E WILLAMETTE RIVER GREENWAY: CUL-RAL AND ENVIRONMENTAL INTERPLAY,
gon State Univ., Corvallis. Dept. of hropology.
primary bibliographic entry see Field 6G.
-01805

ALUATING THE IMPACT OF STRUC-RALLY INTERRUPTED FLOOD PLAIN OWS,
rnell Univ., Ithaca, N.Y. Dept. of Structural gineering.
A. Sangrey, P. J. Murphy, and J. L. Nieber.
ailable from the National Technical Informa-n Service, Springfield, Va 22161 as PB-247 552, 00 in paper copy, $2.25 in microfiche. Cornell iversity Water Resources and Marine Sciences nter, Ithaca, Technical Report 98, October 5. 25 p, 5 fig, 1 tab, 8 ref, 2 append. OWRT A-)-NY(1). 14-31-0001-5032.

scriptors: *Flood plains, *Flood plain zoning, lood damage, Flood proofing, Erosion, ildings, Levees, *Flow around objects, Evalua-n, *Structural models, *Model studies, orecasting.

procedure has been developed for predicting the eraction of flood waters and structures on the od plain. The hydrodynamic predictor is a odified form of the U.S. Army Corps of En-ineers Program HEC-2. Methods for modifying e input for HEC-2 to account for structures on e flood plain are described. These modifications e principally concerned with roughness and oss-sectional area. Using the results of the drodynamic model a procedure is described for timating the loads on flood plain structures. A ndimensionalized form of the loading has been eful in predicting structural damage. A case udy involving modeling of a flood plain for com-rison with damage resulting from Tropical orm Agnes is reported. The damage survey of a gion sample of 155 flood plain structures is par-ularly useful for evaluation of flood damage iteria. A damage criterion has been proposed sed on these data.
76-01808

ELATIONSHIP OF DISCHARGE REDUC-IONS TO AVAILABLE TROUT HABITAT FOR ECOMMENDING SUITABLE STREAM-LOWS,
yoming Univ., Laramie. Water Resources esearch Inst.
A. Wesche.
vailable from the National Technical Informa-on Service, Springfield, Va 22161 as PB-247 514, $5.00 in paper copy, $2.25 in microfiche. Water Resources Series No 53, December 1974. 71 p, 22 fig, 6 tab, 30 ref, append.

Descriptors: *Streamflow, *Aquatic habitats, *Trout, *Average flow, *Flow rates, Discharge(Water).
Identifiers: Trout habitat, *Trout cover, Average daily flow, Minimum flow.

This study to determine suitable streamflows to maintain trout habitat focused on defining changes observed for physical stream characteristics as streamflow was reduced. To relate these changes to reductions in available habitat, criteria were developed defining the cover preferences of trout; criteria from the literature were applied for food production and spawning areas. Trout cover has been defined as instream rubble-boulder areas and overhanging bank cover in association with a water depth of at least 0.50 ft (0.15 m). Using these preferences, a rating system was developed allowing comparisons of available trout cover to be made for one stream section at various discharge levels and for different stream reaches at approximately the same level of flow, based upon the average daily flows (ADF) for the sections. Verification of the rating system as an indicator of the standing crop of trout present was initiated in an attempt to quantify the biological significance of instream dewatering in regard to trout populations. The primary study area had an ADF of 78.7 cfs (2.23 cu m/sec) and was intensively investigated at 100%, 71%, 51%, 38%, 27%, and 11% ADF. Available habitat was found to decrease at the greatest rate for the discharge reduction interval from 27% to 11% ADF. These findings verify earlier results on 2 stream sections having smaller ADFs. As a minimum flow to maintain habitat, a discharge in the 25% ADF range will avoid the flow range for which the rate of habitat decrease is greatest.
W76-01809

DEVELOPMENT OF ASPHALT CUSHIONED PLASTIC REINFORCED ASPHALT MEMBRANES FOR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W76-01812

AN INNOVATIVE ORGANIZATIONAL ARRANGEMENT FOR COMPREHENSIVE WATER SERVICES: THE THAMES WATER AUTHORITY AS A MODEL FOR COMPLEX AREAS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W76-01815

PLANNING WATER RESSOURCES DEVELOPMENT.
Economic Commission for Asia and the Far East (UN), New York.
For primary bibliographic entry see Field 6B.
W76-01818

STORM RUNOFF IN THE VICINITY OF OAK RIDGE, TENNESSEE,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2A.
W76-01841

A WATERSHED SOILS INDEX OF RUNOFF POTENTIAL,
Agricultural Research Service, Coshocton, Ohio.
For primary bibliographic entry see Field 2G.
W76-01848

PERFORMANCE CONTROLS FOR SENSITIVE LANDS: A PRACTICAL GUIDE FOR LOCAL ADMINISTRATORS,
American Society of Planning Officials, Chicago, Ill.
For primary bibliographic entry see Field 6F.
W76-01871

RECENT DEVELOPMENTS IN WATER DISTRIBUTION AND APPLICATION WITH SPECIAL REFERENCE TO SPRINKLER IRRIGATION,
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany). Dept. of Plant Production in Tropical and Subtropical Countries.
For primary bibliographic entry see Field 3F.
W76-01887

AQUATIC HERBICIDES AND THE CONTROL OF WATER WEEDS,
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5G.
W76-01911

PINE ASSOCIATIONS OF THE DERNOVICH STRETCH OF THE PRIPYAT RIVER FLOODPLAIN, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralyn Botanichny Sad.
For primary bibliographic entry see Field 2I.
W76-01918

4B. Groundwater Management

HIERACHICAL MANAGEMENT OF GROUND AND SURFACE WATER SYSTEM VIA MULTICELL APPROACH,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4A.
W76-01501

HYDROGEOLOGY OF GLACIAL DEPOSITS IN TIPPECANOE COUNTY, INDIANA, SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING WATER RESOURCES IN MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W76-01521

UNIQUENESS OF A MODEL OF STEADY-STATE GROUND-WATER FLOW,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W76-01526

USE OF DRAINAGE WELLS,
Bureau of Reclamation, Denver, Colo.
H. H. Ham.
Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. 8 fig, 12 ref.

Descriptors: *Drainage wells, Drainage sysems, Drainage practices, Drainage engineering, Flow systems, Transmissivity, *Subsurface drainage.
Identifiers: *Interfering wells.

Wells are often viewed as an alternative to drains for agricultural subsurface drainage. Where subsurface and other conditions are favorable, wells may offer advantages despite hydraulic and other shortcomings. However, areas of such favorable conditions are limited. Furthermore, improper use of wells may jeopardize long-term productivity of the land. Use of wells for agricultural subsurface drainage may appear advantageous but should be

approached with caution unless investigations have determined that conditions are favorable. (Skogerboe-Colorado State)
W76-01566

PRODUCTION OF SUPERHEATED STEAM FROM VAPOR-DOMINATED GEOTHERMAL RESERVOIRS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 3E.
W76-01587

GROUND WATER IN SELECTED AREAS IN THE KLAMATH BASIN, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2F.
W76-01590

INTERCEPTING TRENCH AT A LANDFILL RENDERS LEACHATE INTO DRINKABLE SOURCE OF WATER,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-01627

EVALUATION OF GEOTHERMAL ACTIVITY IN THE TRUCKEE MEADOWS, WASHOE COUNTY, NEVADA,
Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-01683

GROUNDWATER MANAGEMENT AND SALINITY CONTROL: A CASE STUDY IN NORTHWEST MEXICO,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
J. W. McFarland.
American Journal of Agricultural Economics, Vol 57, No 3, p 456-462, August, 1975. 1 tab, 16 ref.

Descriptors: *Water management(Applied), *Salinity, *Groundwater resources, *Water supply, *Groundwater mining, *Mexico, *Saline soils, *Aquifer management, Water resources, Aquifers, Groundwater, Groundwater basins, Water policy, Water resources development, Groundwater recharge, Water utilization, Water wells, Withdrawal, Hydrogeology, Safe yield, Forecasting, Water allocation(Policy), Saline water intrusion, Irrigation, Leaching.
Identifiers: Sahuaral Irrigation District(Mexico).

The Sahuaral Irrigation District in Mexico, located approximately 200 miles south of the Arizona-Mexico border, is studied with respect to policy issues associated with the management of the coastal groundwater aquifer and soil salinity. The primary policy issues are the time related rate of use of groundwater supply, the allocation of water between irrigation and leaching, and the selection of crops. In order to give operational form to these problems, a management model, in dynamic programming format, is used which indicates that the aquifer should be mined at a rapid rate near the beginning of the planning horizon, gradually decline through time, and converge to safe yield after 29 years. In addition, more water should be allocated to leaching to maintain soil salinity at lower levels. (Robinett-Arizona)
W76-01695

SOUTH PLATTE RIVER FLOW CORRELATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering
For primary bibliographic entry see Field 4A.
W76-01699

USE OF TEST WELLS AS WATER-QUALITY PREDICTIONS,
Wisconsin Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W76-01768

THE SIGNIFICANCE OF HYDROGEN SULFIDE IN GROUNDWATER,
For primary bibliographic entry see Field 5B.
W76-01781

STOCHASTIC MODELS FOR GROUND WATER LEVELS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
R. A. Rao, R. G. Rao, and R. L. Kashyap.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 411, $5.50 in paper copy, $2.25 in microfiche. Purdue University Water Resources Technical Report No 67, August, 1975. 84 p, 21 fig, 17 tab, 20 ref, append. Partial Completion Report, OWRT C-3277(3713) (9).

Descriptors: *Groundwater, *Water table, *Stochastic processes, Statistical models, Surface-groundwater relationshps, Groundwater movement, City planning, Community development, Model studies, Water levels, Water level fluctuations, Aquifers.

The ground water level fluctuations in an aquifer are affected by external causes such as precipitation, outflows from the aquifer, and pumping from the aquifer. Stochastic models are proposed for the fluctuations in ground water levels. Both multiinput-single output and multivariate models have been considered. IN th univariate models, variables such as precipitation, stream flows and others which have been known to affect the ground water levels have been considered as external inputs. The fluctuations in ground water levels and the causal variables are directly built into the multivariate model. The parameter estimation and the residual tests are discussed in detail. The multivariate model was also tested by simulation. The results indicate that the ground water level series can be successfully modeled by stochastic models. These models can be used to evaluate the time lag between precipitation and changes in ground water levels, the effect of the streamflows on water levels in adjacent wells, and the ground water resources in a region. (See also W76-01798)
W76-01799

CYCLIC STORAGE OF FRESH WATER IN SALINE AQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Petroleum Engineering.
O. K. Kimbler, R. G. Kazmann, and W. R. Whitehead.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 426, $6.00 in paper copy, $2.25 in microfiche. Louisiana Water Resources Research Institute, Baton Rouge, Bulletin 10, October 1975, 78 + 52 p, 27 fig, 21 tab, 45 ref, 6 append. OWRT A-022-LA(6) and ORT A-027-LA(6).

Descriptors: *Underground storages, *Water storage, Groundwater recharge, Groundwater movement, Artificial recharge, *Saline water-freshwater interfaces, *Mixing, *Diffusivity, Dispersion, Transmissivity, *Injection, *Injection wells, Model studies, Computer programs, Aquifers, *Water movement(Applied).
Identifiers: Dispersivity, Gravitational laydown, Miscible displacement, Salaquifers, Isopotential zones, Zones of stagnation, Well-field design, Miniaquifers.

The storage of fresh water in horizontal, confined saline aquifers is technically feasible. Experimental results with physical aquifer models involving single and multiple injection/production wells were used to verify computer programs for: prediction of the recovery efficiency (the ratio of retrieved-to-injected fresh water), frontal position of the fresh water bubble; position of the saline water-freshwater interface resulting from gravitational laydown, dispersion, and mixing, and calculation of the dispersivity. For salaquifers with pre existing groundwater movement, an additional program must be used to design a system of injection/withdrawal bounding wells that will neutralize the movement and create a zone of stagnation for the storage project. Tests on tilted physical systems, with and without pre-existing flow showed that deleterious mixing and water movement could occur in aquifers with more than a few degrees of dip. Besides the determination of the usual in-situ hydrogeologic factors for ground water supply systems, additional tests for porosity, dispersivity, and pre-existing flow are required for the design of an Injection/Storage/Production well field. Each additional I/S/P cycle will result in proved recovery efficiency, regardless of the hydrogeologic parameters. All necessary computer programs are detailed in the appendices. Cost estimates for a hypothetical underground storage system compare favorably to an alternate tank storage project. The construction and calibration of the miniaquifers (artificial porous sandstones composed of uniformly-graded sand and epoxy resin) are described along with the test procedures, equipment, and mathematical bases.
W76-01811

DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING THERMAL INFRARED IMAGERY,
Alabama Univ., Huntsville. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-01840

BI-LEVEL SUBSURFACE DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W76-01847

OPTIMUM DESIGN OF DUG-WELLS IN HARD ROCK TERRAINS,
Osmania Univ., Hyderabad (India). Dept. Geology.
For primary bibliographic entry see Field 8E.
W76-01892

INTEGRATING GROUND AND SURFACE WATER USE IN AN APPROPRIATION STATE,
Davis, Graham and Stubbs, Denver, Colo.
W. A. Hillhouse, II.
Rocky Mountain Mineral Law Institute Annual, Vol 20, p 691-720, 1975. 30 p, 71 ref.

Descriptors: *Colorado, *Alluvial acquifers, *Groundwater, *Surface-groundwater relationships, *Water allocation(Policy), Surface water, Irrigation practices, Irregation programs, Preferences(Water rights), Planning, Supply, Water demand, Water rights, Appropriation, Regulation, Legislation.
Identifiers: *Alluvial wells, Non-governmental mechanisms.

Colorado has recognized the need for integrated regulation of ground and surface water use into a single legal system which protects appropriative water rights and encourages maximum utilization of the state's water resources. A persistent problem is that of reconciling the rights of ground water users with those of more senior subsurface water oppropriators. Groundwater sources for irrigation are preferred by most farmers. A central concept in the 1969 Water Right Determination and Administration Act is that groundwater di-

ıs should not be curtailed unless the water uld otherwise have been available to senior ap-priators. The Act also provides for three ices available to private parties: the use of ls as alternate points of diversion for surface nts, the use of substituted supplies of water, l the use of plans for augmentation of current ter supplies. Regulation of alluvial wells was un by the State Engineer. Current rules which e withstood court challenges provide for dual curtailment of groundwater diversion un-s the appropriator can insure replacement to the eam of the appropriated water. This approach igates the problem of the anticipatory call. The blem of measuring the amount of replacement ter required remains unsolved. (Jenkins-rida)
76-01960

IPER V. LUNDVALL (DEFINING GROUND-ATER AS NON-TRIBUTARY IN ARACTER).
r primary bibliographic entry see Field 6E.
76-01998

C. Effects On Water Of Man's Non-Water Activities

ALUATION OF THE EFFECTS OF UR-NIZATION ON AQUATIC ECOLOGY AND DROLOGIC REGIMES.
drocomp, Inc., Palo Alto, Calif.
ailable from the National Technical Informa-n Service, Springfield, Va 22161 as PB247-095, .75 in paper copy, $2.25 in microfiche. Comple-n Report, July 1975, 159 p, 53 fig, 27 tab, 9 ref. WRTC-5103(NO. 4203)(1).

escriptors: *Urbanization, *Water pollution, unoff, Floods, Low flows, Biochemical oxygen mand, Dissolved oxygen, Model studies, Storm noff, Water quality, Simulation analysis, Mary-nd, Colorado, Washington.
entifiers: Patuxent River(Md), Cherry reek(Colo), Issaquah Creek(Wash).

ree hypothetical watersheds, each 60 sq. mi. in ea with the downstream 30 sq mi urbanized were mulated with and without urbanization. Each atershed was assumed to have the drometeorologic, topographic, soils and vegeta-on characteristics of a real watershed--only the ze and urbanization were assumed fixed. The al watersheds which defined the watershed aracteristics wer Issaquah Cr. near Issaquah, ashington; Cherry Cr. near Franktown, olorado and Western Branch, Patuxent River ar Largo, Md. Frequency of peak flows, total nual runoff, flow duration data for 1-day and 21-y intervals, annual mass discharge of B.O.D., d frequency of occurrence of various levels of .O.D. and dissolved oxygen concentrations were mulated for each watershed with and without ur-anization to illustrate the impact of urbanization n the stream hydrology and water quality for ach of the three sets of watershed characteristics. he conclusions as to the impact of urbanization re discussed and the three areas are compared.
76-01514

STIMATION OF THE DISRUPTIVE IMPACT F SNOWFALLS IN URBAN AREAS,
ueensland Univ., Brisbane (Australia). Dept. of eography.
. R. de Frietas.
ournal of Applied Meteorology, Vol 14, No 6, p 166-1173, September 1975. 2 fig, 6 tab, 13 ref.

escriptors: *Snowfall, *Cities, *Hazards, Canada, Snow, Snow removal, Transportation, now management, Social impact, Economic im-act, Winds, Wind velocity, Temperature, leteorology.
Identifiers: *Disruptive impact.

Study aims were the identification and evaluation of the physical characteristics of snowfall and accompanying weather conditions contributing to a description of the disruptive capacity of snowfalls in urban areas. The study focused on five large urban areas of Canada, but it was hoped that the findings would have much wider application. Stepwise multiple regression analysis was applied to a sample of snow season data to reduce the number of variables needed to describe disruptive impact meteorologically. This was combined with a synoptic diagnosis of daily weather phenomena. Specifically, the results indicated that the disruptive intensity of a snowfall event may be expressed by a minimum of three independent meteorological elements, namely, 24-hour snow accumulation and mean wind speed and temperature during the period of fall. (Sims-ISWS)
W76-01859

4D. Watershed Protection

THE RIVER'S REACH: AN ASSESSMENT OF EXISTING FLOOD PROTECTION IN UPSTREAM WATERSHEDS OF THE CONNECTICUT RIVER BASIN.
Soil Conservation Service, Durham, N.H.
For primary bibliographic entry see Field 4A.
W76-01592

CONSERVATION OF SEDIMENT IN IRRIGATION RUNOFF,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
C. W. Robbins, and D. L. Carter.
Journal of Soil and Water Conservation, Vol 30, No 3, p 134-135, May-June, 1975. 3 fig.

Descriptors: *Irrigation water, *Sediment control, *Sediment yield, *Irrigation effects, *Return flow, Sediment load, Soil conservation, Argiculture, Sediments, Erosion, Sedimentation rates, Sedimentation, Deposition(Sediments), Farm ponds, Water pollution sources, Irrigation, Irrigated land, Surface irrigation, Water reuse, Topsoil, Surface runoff, Soil surfaces, Soil management.

Sediment carried in irrigation return flow usually is considered a pollutant, but small watersheds and drainage basins contain many areas where sediment can be removed from the water and used as an economical source of high quality topsoil for filling low areas and leveling land. Experiments were carried out to determine water flow and sediment deposition in a 1.1-acre pond specifically constructed to trap sediment in a low area near an irrigation return drain. During 1972, 167 acre-feet of water passed through the pond depositing 1,254 tons of sediment (7.51 tons per acre-foot of runoff water or 8.4 acre-inches of topsoil). Between April 29, 1973, and July 8, 1973, 185 acre-feet of water deposited an additional 1,379 tons of sediment (7.45 tons per acre-foot of runoff water). The average elevation for the pond was raised 16 inches, and 85 percent of the sediment in the runoff water was removed when the sediment concentration exceeded 0.1 percent by weight. Trapping sediments in man-made ponds must be considered a short-term measure. Solution of the sediment problem over the long term depends on effective conservation treatment at the sediment source. (Robinett-Arizona)
W76-01693

EROSION EVALUATION STUDY,
Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
For primary bibliographic entry see Field 2J.
W76-01829

A WATERSHED SOILS INDEX OF RUNOFF POTENTIAL,
Agricultural Research Service, Coshocton, Ohio.
For primary bibliographic entry see Field 2G.
W76-01848

SOIL-GEOMORPHIC RELATIONSHIPS IN A FIRST-ORDER VALLEY IN CENTRAL NEW YORK,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-01855

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

IMPLEMENTATION OF A N. P. D. E. S. DATA MANAGEMENT SYSTEM,
Krannert School of Industrial Management. Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01502

ESTIMATION OF URBAN STORMWATER QUALITY IN KALIHI STREAM DRAINAGE BASIN, OAHU, HAWAII,
Hawaii Univ., Honolulu, Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W76-01525

INDUSTRIAL POLLUTION OF THE LOWER MISSISSIPPI RIVER IN LOUISIANA.
Environmental Protection Agency, Dallas, Tex. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-01532

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-01577

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES. LEG 15,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2J.
W76-01581

LIQUID CHROMATOGRAPHIC ANALYSES IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
G. Chesters, and D. A. Graetz.
In: 'Chromatographic Analysis of the Environment,' Robert L. Grob, editor. Marcel Dekker, Inc., New York, N. Y., 1975. p 293-324. 1 fig, 4 tab, 102 ref.

Descriptors: *Analytical techniques, *Chromatography, *Soils, *Distillation, Pesticide residues, Humus, Separation techniques, Fulvic acids, Humic acids, Colloids, Carbohydrates, Organophosphorus pesticides, Chlorinated hydrocarbon, Triazine pesticides, *Pollutant identification.
Identifiers: *Liquid chromatography, Gel filtration, Waxy components.

The limited applications of liquid chromatography (LC) to soils stems largely from the poor resolution that can be achieved by this method and to the fact that no satisfactory detection systems for the column eluent have so far been devised. Informa-

tion on soil sampling and techniques used are reviewed. Since the major use of LC is as a cleanup technique, separation of interferences and concentration techniques as related to humic and fulvic acids, centering on Sephadex gel filtration columns (to provide a fractionation based on molecular weight) is discussed. Phosphorus compounds in soils are most often fractionated by paper or anion-exchange chromatographic methods but column chromatographic methods have been used occasionally in conjunction to separate organic phosphorus from excess salts prior to quantitative estimation of ribonucleic acid phosphorus by anion-exchange chromatography. Hydrolyzates of soil extracts containing carbohydrates have been purified and fractionated by a variety of LC procedures, as applicable to results required. LC is particularly well suited for cleanup of highly pesticide contaminated materials, such as soil extracts and it has been used extensively for cleanup of biological and soil extracts containing organochlorine and organophosphorus insecticides and herbicides. Trade and chemical names of the pesticides discussed and systems used are given. (Auen-Wisconsin)
W76-01636

PAPER CHROMATOGRAPHIC ANALYSIS IN AIR POLLUTION,
Wisconsin Univ., Madison. Water Resources Center.
G. Chesters, and D. A. Graetz.
In: 'Chromatographic Analysis of the Environment,' Robert L. Grob, editor. Marcel Dekker, Inc., New York, N.Y., 1975, p 179-192. 62 ref.

Descriptors: *Analytical techniques, *Chromatography, *Air pollution, Aromatic compounds, Organic compounds, Alcohols, Phenols, *Pollutant identification.
Identifiers: *Paper chromotography, Polynuclear aromatic hydrocarbons, Carbonyl compounds.

Paper chromatography (PC) has not been applied extensively to air pollutants; the majority of the literature deals with the separation and identification of polynuclear aromatic hydrocarbons. Specific sampling techniques and the sensitivity of particular methods are discussed. Organic contaminants are among the major components of atmospheric pollution and the polynuclear aromatic hydrocarbons have been of greatest concern because several display carcinogenic properties. Acetylated PC has also been used in analyzing polynuclear aromatic hydrocarbons in tobacco smoke, automobile exhausts, and polluted air with excellent resolution of closely related compounds. PC has been used for the separation and identification of the 2,4-dinitrophynylhydrazones of aldehydes and ketones; by quantitative conversion of carbonyls to their 2,4-dinitrophynylhydrazone derivatives, satisfactory separation of carbonyl compounds in air, cigarette smoke and car exhaust samples can be achieved. PC for separating volatile aliphatic alcohols as their 3,5-dinitrobenzoate derivatives is described. Aliphatic amines have been identified by gas chromatography as to their benzamides with excellent resolution. For qualitative analysis and for purification of samples the PC technique has proved useful but because of the low carrying capacity of paper, the method is restricted as a quantitative technique. (Auen-Wisconsin)
W76-01637

PAPER CHROMATOGRAPHIC ANALYSIS IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
G. Chesters, and D. A. Graetz.
In: 'Chromatographic Analysis of the Environment,' Rober L. Grob, editor. Marcel Dekker, Inc., New York, N.Y., 1975, p 325-375. 4 tab, 311 ref.

Descriptors: *Analytical techniques, *Chromatography, *Soils, Humus, Carbohydrates, Amino acids, Pesticides, Inorganic compounds, Chlorinated hydrocarbon, Organophosphorus pesticides, Insecticides, Herbicides, *Pollutant identification.
Identifiers: *Paper chromatography.

For analyses of indigenous soil components perhaps the most extensive qualitative use of paper chromatography (PC) is for determination of amino acids, but this form of analysis has been superceded largely by column ion-exchange chromatography. For pesticide analyses of soil and sediment extracts, paper chromatography serves for cleanup of samples prior to determination by some other analytical method; semiqualitative determination of pesticides in soil and sediment extracts; indentification of intact pesticides, and identification of unknown metabolites and other pesticide degradation products; and screening tests for possible pesticidal contamination of soils and sediments. However, the method possesses the disadvantage of being too tedius and time consuming for routine analysis and gas chromatography has proved to be more efficient. PC still possesses utility for separating multiple-component systems and for identifying unknown components, particularly when it is implemented by other methods. In the determination of inorganic compounds in soils, developments in PC methodology continue to be made; however, widespread environmental use of this tehcnique for determining toxic elements is unlikely, particularly for those metal ions capable of forming volatile coordination complexes. The methods and uses of PC analysis in humic materials and their degradation products, carbohydrates, organic phosphates, amino acids, pesticides, and inorganic components are described. (Auen-Wisconsin)
W76-01638

ELECTROCHEMICAL DETECTION OF NH4 PLUS NH3 SYSTEMS IN WATER,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
American Society for Testing and Materials, Special Technical Publication 573, p 20-24, 1975, 1 fig, 6 ref.

Descriptors: *Ammonia, *Analytical techniques, *Electrodes, Measurement, *Pollutant identification, *Electrochemistry, Water analysis, Chemical analysis.

Ammonia determination by conventional colorimetric methods or distillation normally yields total ammonia concentration in water samples. It is however, the unionized free ammonia that exerts adverse physiological or histopathological effects on fish as the threshold lethal concentration-50 is 0.2 mg/l ammonia. Free unionized ammonia concentrations depend on sample pH and temperature and can be calculated from ionization constants for different temperatures. Total, ionized, and unionized ammonia can be directly measured as ammonium ion with a univalent (monovalent) cation electrode; unionized free ammonia using a membrane-type ammonia electrode (ammonia probe); and total ammonia using a membrane-type ammonia electrode after converting ammonium ion to ammonia by alkalization of the sample to about pH 12. Specific ion electrodes are not as accurate as spectrophotometric ammonia determinations below 1 mg/l, but at higher concentrations they do not require sample dilution, are faster, and the sample volume is minimal. Continuous monitoring and signaling of dangerous ammonia levels would be possible. Glass electrodes are less expensive, specific, versatile, and faster than ammonia probes but are limites to waters with low, constant potassium and sodium ion background. Both electrodes can be used simultaneously in the same or a continuous sample, since no pretreatment is needed. (Buchanan-Davidson--Wisconsin)
W76-01652

A CURRICULUM ACTIVATIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES, APPENDICES, VOLUME 2.
Environmental Protection Agency, Washington D.C. Training Grants Branch.
For primary bibliographic entry see Field 5G.
W76-01660

POTENTIOMETRIC TITRATION BEHAVIO OF SODIUM SULFIDE, METHYL MERCAP TAN, DIMETHYL SULFIDE, DIMETHY DISULFIDE AND POLYSULFIDES IN MIXE ALKALINE SOLUTIONS AND SULFATE PUL ING BLACK LIQUORS,
Borden Chemical Co., New Westminster (Britis Columbia).
S-T. Chiu, and L. Paszner.
Analytical Chemistry, Vol 47, No 12, p 1910-191 October, 1975. 7 fig, 5 tab, 30 ref.

Descriptors: *Waste water treatment, *Industri wastes, *Pulp and paper industry, Analytic techniques, Pollutant identification, Sulfi liquors.
Identifiers: *Potentiometric titration.

Current regulations on water and air polluti abatement necessitate the development of acc rate and rapid analytical techniques for estimati treatment requirements for discharged pollutan Potentiometric titration curves were obtained f two polysulfide and four sulfate black liquo Potentiometric titration of mercaptan fortifi sulfate black liquors produced three inflecti points. The first potential drop was due monosulfide, the second was due to ganic/inorganic polysulfide (bound mercapta and the third to ionized free mercaptan. Most the mercaptide ion in normal mill run black liq is bound by traces of elemental sulfur to form gano-polysulfide which contributes to the pot tiometric titration. This increases the difficulty volved in the determination of methyl mercap by potentiometric titration. Correct interpretati of the titration curves is critical to the success sulfide analysis of black liquors. Thiolignin had measurable effect on the results of potentiome titration of sulfides in black liquors. The par abatement of air pollution from the sulfate pulp process can be achieved by periodically adding excess of elemental sulfur to keep the ratio of mental sulfur to mercaptide sulfur greater than throughout the cooking stage. (Orr-FIRL)
W76-01670

HEAVY METAL (CU, PB, ZN, CD, NI, AS, ADDITIONS TO SURFACE WATE STREAMS SEDIMENTS AND SELECT AQUATIC LIFE IN THE MERAMEC PA RESERVOIR DRAINAGE BASIN, MISSOURI
Missouri Univ., Rolla. Dept. of Geology Geophysics.
For primary bibliographic entry see Field 5B.
W76-01686

STANDARD CONDUCTIVITY CELL FOR M SUREMENT OF SEA WATER SALINITY TEMPERATURES,
Westinghouse Electric Corp., Pittsburgh, (Assignee).
For primary bibliographic entry see Field 2K.
W76-01716

ENVIRONMENTAL CHEMISTRY IN NETHERLANDS,
Waterloo Univ. (Ontario). Dept. of Chemistry.
F. W. Karasek, and O. Hutzinger.
Research/Development, p 40-46, September, 1 4 fig.

Descriptors: *Water pollution control, *For research, *Education, Research and developm Analytical techniques, Pollutant identifica *Chemistry.

ifiers: *Netherlands, Environmental chemis-

ough, in most countries, environmental con-
rograms are focused on monitoring and test-
ollutants, the Netherlands has expanded its
rch to environmental chemistry. Highly in-
ialized, small and densely populated, the
erlands has managed to limit the number of
strialized areas by means of good land
agement and a growing fight against present
otential problems. Research has been mainly
ucted in government laboratories and secon-
y in some universities. Now, however,
emics are playing an increasingly important
Many universities have programs in the en-
mental sciences although only the University
msterdam has a graduate program leading to a
ee in environmental chemistry. Some depart-
ts participate in government sponsored inter-
iplinary studies which include environmental
nistry. Course work for the latter is broad
e student research projects are highly specific.
earch in environmental chemistry involves
ing and identifying a great number of complex
changing organic compounds many of which
found in complex environmental milieux and in
ntities of a nanogram and picogram dimension.
roved analytic procedures are being evolved
such compounds. (Waltner-FIRL)
5-01734

TRIAL OF APPLICATION OF A
OSELECTIVE ELECTRODE FOR NITRATE
TERMINATION IN SANITARY-HYGIENIC
AMINATIONS OF WATER (PROBA
STOSOWANIA ELEKTRODY JONOSELEK-
WNEJ DO OZNACZANIA AZOTANOW W
NITARNYM BADANIU WODY),
Nowak, and J. Luczak.
czniki Panstwowego Zakladu Higiency, Vol 26,
3, p 401-405, 1975, 1 fig, 1 tab, 6 ref.

scriptors: *Pollutant identification, *Analytical
hniques, Colorimetry, Electrodes, Nitrogen,
blic health, Selectivity, *Nitrates.

o methods for the determination of nitrate-
rogen in water, the colorimetric method and a
oselective nitrate electrode technique, were
nparatively investigated. The results of mea-
ements by both methods were in the closest
reement in the range of nitrate-nitrogen concen-
tion greater than 1.0 mg/liter. This range is par-
ularly important for the public health specialist.
rr-FIRL)
76-01751

IE CHEMICAL COMPOSITION OF THE
PPER LAYER OF SAPROPEL FROM THE
ITNA LAKES, (IN RUSSIAN),
kademiya Nauk Estonskoi SSR, Tartu. Inst. of
ology and Botany.
r primary bibliographic entry see Field 2H.
76-01753

HARACTERIZATION OF AROMATIC
YDROCARBONS (CHARAKTERISIERUNG
ROMATISCHER KOHLENWASSERSTOFFE),
. Giger, M. Reinhard, and C. Schaffner.
om Wasser, Vol 43, p 343-358, 1974. 7 fig, 1 tab,
ref.

escriptors: *Pollutant identification, *Analytical
chniques, *Oil wastes, Aromatic compounds,
ewage, Fuels, Water pollution sources, Industrial
astes, Computers, Gas chromatography, Mass
ectometry.
dentifiers: *Aromatic hydrocarbons.

romatic hydrocarbons are known to be common
nvironmental pollutants. It is usually difficult if
ot impossible to establish the origin of these
ydrocarbons. Their source may be spills of fossil
uels or fallout of incompletely combusted organic material, or wastes from trade and industry. Analytical methods for detecting aromatic hydrocarbons are outlined. A detailed discussion is presented on a method based on a combined system of gas chromatography and mass spectrometry. The data handling for this technique is performed by an on-line coupled computer. Domestic sewage, diesel fuel, and sediment recently contaminated by oil were analyzed by this method. An extensive characterization of the aromatic hydrocarbon mixtures in sewage and sediment samples permits the identification of their origin. (Orr-FIRL)
W76-01754

A NEW METHOD FOR DETERMINATION OF ORGANICALLY BOUND CARBON IN WATER BY PHOTOCHEMICAL OXIDATION (EIN NEUES VERFAHREN ZUR BESTIMMUNG VON ORGANISCH GEBUNDENEM KOHLENSTOFF IN WASSER DURCH PHOTOCHEMISCHE OXIDATION),
P. Woelfel, and H. Sontheimer.
Vom Wasser, Vol 43, p 315-325, 1974, 7 fig, 11 ref.

Descriptors: *Organic compounds, *Dissolved solids, *Analytical techniques, Ultraviolet radiation, Irradiation, Oxidation, *Pollutant identification, Rates.
Identifiers: *Photochemical oxidation, Organic carbon, Oxidation rates.

Dissolved organic carbon may be determined by a new method presented. Organic carbon compounds are oxidized at 40 C by means of ultraviolet radiation. The radiation source is a special low-pressure mercury lamp, which is submerged in the reactor. The instrument is sensitive enough to detect 0.001 mg of dissolved organic carbon in one liter of water. Each analysis provides a characterization of the particular organic material of the sample, because of the different rates of oxidation of various organic substances. (Kramer-FIRL)
W76-01756

OBSERVATIONS ON THE ASSOCIATION BETWEEN MERCURY AND ORGANIC MATTER DISSOLVED IN NATURAL WATERS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
A. W. Andren, and R. C. Harriss.
Geochimica et Cosmochimica Acta, Vol 39, No 9, p 1253-1258, September, 1975. 3 fig, 1 tab, 38 ref.

Descriptors: *Mercury, *Salinity, *Organic matter, Fresh water, *Estuarine environment, Mississippi River, Florida, Dissolved solids, Analytical techniques, *Pollutant identification.
Identifiers: Fulvic matter, Organic carbon.

An investigation was made on the association of mercury with dissolved organic matter and the effect of salinity variations on the forms and transport of dissolved mercury from fresh water to marine environments. Samples of estuarine environments were taken from the Mississippi Delta and from the Florida Everglades. It was found that dissolved mercury in estuarine waters from these two areas is associated with dissolved organic matter which has the properties of fulvic matter found in soils. The role of methylmercury in the transport of dissolved mercury was insignificant in these estuarine streams. In the Mississippi River, most of the dissolved mercury and most of the dissolved organic carbon existed in the less than 500 molecular size cut-off fraction. Molecular size distribution for both organic carbon and mercury showed very little change across the salinity gradient. The Everglades waters, with a very high dissolved organic carbon content, may be partially regulated for dissolved mercury by coprecipitation with large organic molecules. From both observed and experimental evidence, it was indicated that mercury is not readily exchangeable from dissolved organic matter in the transition from fresh water to sea water. (Kramer-FIRL)
W76-01757

EVALUATION OF A SINGLE-STEP BACTERIAL POLLUTION MONITOR,
Millipore Corp., Bedford, Mass.
R. A. Cotton, K. L. Sladek, and B. I. Sohn.
Journal of the American Water Works Association, Vol 67, No 8, p 449-451, August, 1975. 4 fig, 3 tab, 6 ref.

Descriptors: *Membranes, *Filters, Water pollution, Statistical analysis, Bacteria, Monitoring, Sampling, Coliforms, *Pollutant identification.
Identifiers: *Bacterial pollution monitor, Millipore filters, Total-bacteria.

A single step bacterial pollution monitor is discussed and evaluated. This monitor is a self contained filtration unit, nutrient supply and incubation chamber, and, when immersed in water, samples a one ml aliquot. This was compared with standard membrane and filter techniques. Results with the new sampler compared favorably and were within statistical error of the standard tests. Statistical variations can be caused by the inherent randomness of sampling and by the variability of the test itself. This method of bacteriological testing can be useful when a simple, quick, and accurate test method is required. (Pinto-FIRL)
W76-01758

SOURCES OF POLLUTION FROM MILITARY INSTALLATIONS, PART II,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5B.
W76-01763

ANALYTICAL DETERMINATION OF ORGANIC CHLORO-COMPOUNDS BY TEMPERATURE-PROGRAMMED PYROHYDROLYSIS (ZUR ANALYTISCHEN ERFASSUNG ORGANISCHER CHLORVERBINDUNGEN MIT DER TEMPERATURPRO-GAMMIERTEN PYROHYDROYSE),
W. Kuehn, and H. Sontheimer.
Vom Wasser, Vol 43, p 327-341, 1974. 6 fig, 4 tab, 19 ref.

Descriptors: *Pollutant identification, *Analytical techniques, Organic compounds, Adsorption, Activated carbon, Phenols.
Identifiers: Chlorine compounds, Pyrohydrolysis.

A proposed method for the analytical determination of organic chloro-compounds is described. Termed pyrohydrolysis, this method detects the total amount of chloro-compounds adsorbed no activated carbon. Inorganic chlorides may be eliminated by washing with NaN03 solution. Besides measuring the total content of these organic compounds, the characterization of a specific composition may be found by measuring the desorption at different stages of temperature and time. Additionally, the mechanism of thermal decomposition of chloro-phenols on activated carbon was studied. (Kramer-FIRL)
W76-01766

SURVIVAL OF ENTEROBIRUSES ON VEGETABLES IRRIGATED WITH CHLORINATED OXIDATION POND EFFLUENTS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Food Engineering; and Technion Israel Inst. of Tech., Haifa. Dept. of Biotechnology.
For primary bibliographic entry see Field 5C.
W76-01767

USE OF TEST WELLS AS WATER-QUALITY PREDICTIONS,
Wisconsin Univ., Oshkosh. Dept. of Geology.
C. W. Fetter, Jr.
Journal of the American Water Works Association, Vol 67, No 9, p 516-518, September, 1975. 8 fig, 1 tab.

Descriptors: *Test wells, *Water quality, Drilling, Groundwater, Water wells, Well casings, Well screens, Casings, Grouting, Water pollution, Chemical analysis, Sodium, Chloride, Iron, Alkalinity, Specific conductivity, Pollutant identification.
Identifiers: *Water quality predictors, Long Island(NY).

Groundwater quality can vary from good to unacceptable over certain areas. The use of test wells as water quality predictors was studied. They can be especially useful in cased wells, where the majority of the expense lies in casing, the well screen, the gravel pack, the grouting, and the development. A test well, expensive as it may be, will be less expensive than the purification process that must be used on contaminated water. Another advantage is that the casing and screen for the test well can be used again in other test wells. The test wells discussed were built in Suffolk County on Long Island, where the groundwater can have large variations. The first stage in building a test well is drilling a test boring, either 12 in or 20 in in diameter. Core samples are taken and analyzed by a geologist every 10 or 20 feet. From the samples, the geologist will decide which zones or levels are suitable for testing. The hole is backfilled for the testing to take place. A complete chemical analysis is made on a sample of water taken from the well. Samples are analyzed for sodium, chloride, iron, hardness, alkalinity, and specific conductivity. In the eight test wells drilled on Long Island, the correlation with the permanent wells were excellent. Specific conductivity tended to be slightly higher in the permanent well than in the test well, as were concentrations of chloride, sodium, hardness and alkalinity, with very few exceptions. Iron tended to be less concentrated in the permanent well than in the test well. (Pinto-FIRL)
W76-01768

TRACE METALS IN MELBOURNE RIVERS-AN INTERLABORATORY ANALYSIS,
Materials Research Labs., Ascot Vale (Australia).
A. T. Phillip, R. W. Pettis, J. E. Harris, G. J. Fabris, and P. L. Boar.
Proceedings of the Royal Australian Chemical Institute, Vol 42, No 8, p 209-215, August, 1975. 1 fig, 5 tab.

Descriptors: *Analytical techniques, *Heavy metals, *Pollutant identification, Estuaries, Oceans, Rivers, Sampling, Laboratory tests, Copper, Lead, Cadmium, Toxicity.

Analytical techniques and procedures utilized in the study of trace metals in river estuarine and oceanic waters are reviewed. Three independent Melbourne (Australia) laboratories conducted the experiments. Copper, lead and cadmium were the selected trace metals because of their high toxicity to a large variety of aquatic and marine biota. River water samples were taken from the surface of the Yarra and Maribyrnong Rivers at three stations. Two sets of water samples were made at a fourteen day interval. The first set of samples was put directly into the receptacles without acid addition. Two of the laboratories determined total metal content while the third one determined the dissolved-metal content. The second set was immediately acidified when collected. All three laboratories determined total metal content. Experimental procedures are described. The overall mean concentrations found were: copper 6.9+ 1.5 microgram/liter, lead 5.4 +1.5 microgram/liter, and cadmium less than 0.5 microgram/liter. The results are comparatively similar to those found in various other streams in different parts of the world. These concentrations of the metals are considered to be below the safety level although they may be toxic to the more sensitive aquatic species. Further interlaboratory work is encouraged in order to establish accurate analytical procedures for trace metals and to further calibrate interlaboratory studies. (Waltner-FIRL)
W76-01770

THE EFFECTS OF OZONE DEODORIZATION EQUIPMENT FOR THE SEWAGE ODOR (GESUI SHUKI NI TAISURU OZON DASSHUSOCHI NO KOKA),
For primary bibliographic entry see Field 5D.
W76-01771

WASTEWATER SAMPLE PRESERVATION,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
A. Benedek, and A. Najak
Water and Pollution Control, Vol113, No 9, p 20-24, 31, September, 1975. 36 ref.

Descriptors: *Preservation, *Waste storage, *Biochemical oxygen demand, *Chemical oxygen demand, Nitrates, Nitrites, Nitrogen, Ammonia, Phenols, Phosphorus, Analytical techniques, *Pollutant identification.
Identifiers: Sample freezing, Waste water samples, Acidification.

A summary is presented of sample preservation techniques for the major parameters of waste water, including BOD, COD, suspended solids, nitrates, nitrites, total nitrogen, ammonia, phenols, and phosphorus. The techniques are applicable in cases when waste water samples cannot be immediately analyzed. Because changes taking place in the samples are either biological or chemical, preservation serves to retard biological action, to inhibit precipitation and hydrolysis of chemical compounds, or to retard the volatility of various constituents. The physical methods commonly used are refrigeration or freezing. Several chemical methods are applicable, these are usually dependent upon the addition of metalbolism suppresents. Tables are presented for each of the major waste water parameters, with a brief discussion and recommendation for each. For BOD, freezing or refrigeration is recommended, and values will tend to be low. For COD, acidifcation with sulfuric acid or freezing is suggested. Suspended solids are not preserved well and immediate analysis is the best alternative. Preservation of nitrates may be accomplished by refrigeration plus sulfuric acid. Ammonia may be preserved by refrigeration plus the addition of not more than 40 mg/liter mercuric chloride. Nitrites, however, should be analyzed immediately. For phenols, the addition of one g/liter copper sulfate, and acidification to pH 2 to 2.5, followed by storage in glass bottles with immediate refrigeration is recommended. Phosphates may be preserved by acidification plus refrigeration, while total phosphorus is best kept by acidification and freezing. (Kramer-FIRL)
W76-01772

THE SIGNIFICANCE OF HYDROGEN SULFIDE IN GROUNDWATER,
For primary bibliographic entry see Field 5B.
W76-01781

WATER QUALITY STUDIES AND LAND-USE MAPPING USING ERTS-1 DATA,
Lund Univ. (Sweden). Dept. of Geography.
U. Hellden, and H-A. Olsson.
Journal of the British Interplanetary Society, Vol 28, No 9/10, September/October, 1975. 9 fig, 15 ref.

Descriptors: *Satellites(Artificial), *Monitoring, *Land use, *Pollutant identification, Oil spills, Lakes, Industrial wastes, Eutrophication, Sewerage, Water pollution sources.
Identifiers: LANDSAT, Sweden.

The use of ERTS-1 data for water quality studies and land-use mapping is discussed. In this application, sewage conditions of Copenhagen in the Oresund and 161 lakes in South and Middle Sweden were investigated. The effects of waste disposal from sewers on lake and Middle Sweden were investigated. The effects of waste disposal from sewers on lake eutrophication may be o served by satellite MSS images. Industrial pol tion was also observed, including the discovery a belt of oil pollution in the southern part of t Baltic. Circulation of polluted water due to m nicipal and industrial wastes was followed variation in reflectivity of a great number of lakes was found, and significant regional d ferences were compared. Correlations betwe the satellite spectrophotometry measurements a in situ turbidity and transparency data were q good. The MSS images of chlorophy (containing algae and plankton) water reflec most intensively within the band 0.4 to micrometers and industrial water pollut reached highest reflection in the band 0.6 to micrometers. It was thus shown that the chann most suitable for water quality detection ERTS-1 MSS4 and MSS5. From the imagery d gathered, a detailed differentiation of land use the coastal area of Sweden was prepa (Kramer-FIRL)
W76-01792

ALARM SYSTEMS PROVIDE LOW COST VIRONMENTAL PROTECTION,
Beavin Co., Baltimore, Md.
For primary bibliographic entry see Field 5D.
W76-01795

OIL/WATER TANK CONTENT PROFILES,
Exxon Research and Engineering Co., Flor Park, N.J.
R. J. Skocypec.
Available from the National Technical Infor tion Service, Springfield, Va 22161, as COM 10540, $6.00 in paper copy, $2.25 in microfi Report EE.30TMR.71, December 1971. 127 p fig, 9 tab, 3 append. Department of Commerc 1-35049.

Descriptors: *Water pollution, *Oil pollut *Oily water, Ships, Profiles, Measurement, S pling, Oil wastes, Oil industry, Oil-water interf Oil.
Identifiers: *Ballast tanks, Oil tankers.

Static oil content profile data was compiled ballast tanks aboard Esso tankers in dirty ser Dirty ballast tanks were found to contain a tively clean bulk water phase with a surfac layer of a few inches in thickness and an incre oil content near the botton of the tank about of the time. The mean bulk oil contents of al dirty ballast profiles showed a log-normal pr bility distribution with mean oil content of 18 as both free and dissolved oil. Clean ballast t were found to be extremely clean with 50% o profiles showing mean oil contents below 3 No obvious correlation between oil content tank cleaning time could be detected. Little than a sheen was usually detected at the sur Slop tank profiles showed widely spread ranging from a low of 30 ppm to high of 500 oil. There was no apparent reason for phenomenon and further investigation of tanks was recommended. Oil layer thickn were on the order of several feet. (Sims-ISWS W76-01837

FEASIBILITY OF REMOTE SENSING FOR TECTING THERMAL POLLUTION--PAR FEASIBILITY STUDY; PART II: IMPLEM TATION PLAN,
Miami Univ. Coral Gables, Fa. Dept. of Mec cal and Industrial Engineering.
T. N. Veziroglu, and S. S. Lee.
Available from the National Technical Info tion Service, Springfield, Va 22161, as N75-1 $7.50 in paper copy, $2.25 in microfiche. R NASA CR-134453, December 1973. 177 p, 9 tab, 42 ref, 2 append. NASA NAS10-8402.

Descriptors: *Remote sensing, *Thermal tion, *Powerplants, Heated water, Temper

ity, Turbidity, Measurement, Instrumenta- Equipment, Pollutant identification, Satel- Artificial), Aircraft, Water pollution, Path of tants, Water cooling, Thermal powerplants, ematical models, Model studies.

problems associated with thermal pollution ompounded by recent trends of building more larger nuclear power plants in order to meet rowing energy demand. The first part of the rt, covering the feasibility study, indicated (1) using passive remote sensing methods, y it is possible to detect water surface tem- tures within plus and minus one degree with a ution of 0.3 mile radius from spacecraft; (2) active remote sensing methods, techniques instruments could be developed for remote ing of vertical temperature and turbidity dis- tions in oceans; and (3) it is feasible to lop a generalized three-dimensional model to ict the motion, temperature, and salinity of mal plumes within waters to which they are harged. The second part of the report, cover- the implementation plans, included: (1) the lopment and testing of a universal analytical el to predict three-dimensional temperature salinity distributions in coastal regions receiv- hot discharges, (2) improving the accuracy of thermal remote sensing systems, and (3) the lopment and testing of an active remote ing system to measure the water tubidity. s-ISWS)
5-01838

RACTION OF INFORMATION ON INOR- NIC WATER QUALITY,
eau of Reclamation, Denver, Col. Water Quali- ffice.
L. Lane.
orado State University Hydrology Paper No July 1975, 74 p, 44 fig, 32 tab, 87 ref. NSF GK- 12.

scriptors: *Time series analysis, *Mathematical dels, *Dissolved solids, *Water quality, linity, *Conductivity, Streamflow, Hydrology, ter chemistry, Inorganic compounds, Pollutant ntification.
ntifiers: Henry's Fork River(Utah), New Fork er(Wyo), Pecos River(NM), Saline er(Kan), Wind River(Wyo).

e potential for obtaining information concerning tain water quality variables on a stream by con- ering the relationships which exist between lity and quantity variables was examined. re precisely, the study was concerned with the ationship which exists between discharge and rganic water quality in natural streams. Inor- ic water quality was taken to refer to the con- trations of inorganic constituents found dis- ved in the stream water. Natural streams were fined as those streams which are free of man's luence, although some compromise of this finition was necessary in actual application. The ationship studied was the negative correlation tween inorganic water quality and discharge ich is found in virtually all streams. Study was ited to 13 inorganic constituents. A relationship tween constituent concentrations and conduc- ity based on chemical theory was developed and applicable to any stream sample. Applications re made using data from five streams. (Lardner- WS)
76-01844

ORMATION OF CLOUD AND ICE NUCLEI BY HE COMBUSTION OF CRUDE OIL,
ational Oceanic and Atmospheric Administra- n, Boulder, Colo. Environmental Research Lab.
or primary bibliographic entry see Field 2B.
76-01857

ACTIVITIES AND NEEDS RELATED TO RADIOACTIVITY STANDARDS FOR ENVIRONMENTAL MEASUREMENTS.
Oak Ridge National Lab., Tenn.
Environmental Protection Agency, Report EPA-670/4-75-006, June 1975. 55 p. 1HA327; ROAP 24AAK; Task 003.

Descriptors: *Radioactivity, *Radioisotopes, Monitoring, Measurement, *Quality control, *Radioecology, *Pollutant identification, Standards, Analytical techniques, Radioactivity techniques, Environmental techniques.
Identifiers: *Environmental radioactivity, Environmental monitoring, Radioactivity standards, Radioactive decay schemes.

A symposium was held to discuss the needs for radioactivity standards in environmental monitoring programs concerned with population radiation exposure. Papers were presented on 'Status of Decay Schemes,' 'Some Activities and Needs for AEC Regulatory in the Use of Radioactivity Standards,' 'Standards for Environmental Studies,' 'Program and Activities of the Quality Assurance Branch, NERC-Las Vegas,' 'Activities of Commercial Radionuclide Producers,' and 'Radionuclide Metrology and Quality Assurance.' The presentations indicated that numerous radioactivity standards and aids for correctly utilizing them were available. New needs, however, had arisen recently because lower levels of ambient radioactivity must be measured by many more groups due to requirements that population radiation exposure from nuclear power production be as low as practicable. Based on the presentations and resulting discussions, the following actions were recommended: (1) Establish a focal point for systematically planning activities to meet cited needs for decay schemes, specific standards, analytical methods, and quality assurance programs; (2) Develop a clear chain of traceability to the National Bureau of Standards; (3) Prepare guides for standardizing radiation detection and maintaining quality control; and (4) Train qualified analysts to obtain satisfactory analytical results. (EPA)
W76-01861

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON MANGANESE.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 291, $4.50 in paper copy, $2.25 in microfiche. Report EPA-600/6-75-002, April 1975. 56 p, 3 fig, 30 tab, 124 ref. 1AA001; ROAP No. 26AAA.

Descriptors: *Manganese, Reviews, Measurement, Evaluation, Control, Path of pollutants, Toxicity, Environment, Ecology, Air pollution effects.
Identifiers: Manganism.

A review and evaluation are presented of the current knowledge of manganese in the environment as related to possible deleterious effects on human health and welfare. Sources, distribution, measurement, and control technology are also considered. Manganese is associated with small particles in the air. Concentrations measured in ambient air averaged 0.1 microgram/cubic m3 (annual) with a maximum of 8.3 microgram/cubic m (annual) near a large source. In Norway, a form of pneumonia was attributed to airborne manganese in a community where concentrations were measured at 46 microgram/cubic m3. Manganese poisoning characterized by progressive central nervous system deterioration has occurred under occupational exposure but apparently not from atmospheric exposure. Control of fine particulate emissions should reduce manganese emission considerably. (EPA)
W76-01863

ANALYSIS OF HYDROCARBONS IN MARINE ORGANISMS: RESULTS OF IDOE INTERCALIBRATION EXERCISES,
Woods Hole Oceanographic Institution, Mass.
J. W. Farrington, J. M. Teal, J. G. Quinn, P. L. Parker, and K. Winters.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 459, $3.50 in paper copy, $2.25 in microfiche. Woods Hole Oceanographic Institution Contribution Number 3353, Sept, 1974. 10 p, 3 tab, 5 ref.

Descriptors: *Analytical techniques, *Organic compounds, *Pollutant identification, *Methodology, *Gas chromatography, Laboratory tests.
Identifiers: International Decade of Ocean Exploration, Intercalibration, Accuracy, Tissue analysis, Squalene, Pristane.

Intercalibration exercises conducted as part of the International Decade of Ocean Exploration's baseline studies of ocean pollutants provide an assessment of the precision and accuracy of analyses of marine organisms for hydrocarbons. No methods were specified for the analysis. In all cases, the hydrocarbons were separated from other lipids by column or thin-layer chromatography and then analyzed by gas chromatography. One intercalibration exercise involved the analysis of a tuna meal sample provided as a working intercalibration sample through the courtesy of the National Bureau of Standards. Three laboratories reported the sample as containing 29.5 to 49.0 micrograms of hydrocarbons not resolved by medium resolution gas chromatography columns/gram dry weight of tuna meal. These represent petroleum hydrocarbons by the gas chromatography criteria for a first screening of samples to detect petroleum hydrocarbons. Four laboratories reported pristane concentrations of 1.9, 3.0, 5.9 and 2.0 micrograms/gram dry weight of tuna meal. Results of analysis for individual n-alkanes are also reported. (Katz)
W76-01901

APPENDICES TO: SURVEY STUDY TO SELECT A LIMITED NUMBER OF HAZARDOUS MATERIALS TO DEFINE AMELIORATION REQUIREMENTS,
Little (Arthur D.) Inc., Cambridge, Mass.
W. L. Lyman, L. Nelson, L. Partridge, A. Kalelkar, and J. Everett.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A004 312, $11.75 in paper copy, $2.25 in microfiche. Prepared for: Department of Transportation, U.S. Coast Guard, Office of Research and Development, Washington, D.C. 20590, March 1974. 621 p.

Descriptors: *Hazards, Regulation, *Chemicals, *Standards, *Classification, *Safety, Pollutants, *Chemcontrol, Documentation, Water pollution sources, Water quality control, Evaluation, Pollutant identification.
Identifiers: *Amelioration requirements, Amelioration techniques, *Hazardous substances, Discharges, Risk analysis.

This is the appendix to a work which entailed the categorization of hazardous chemicals according to physical and chemical characteristics that were perceived to be important to the development of amelioration techniques. A total of 400 hazardous chemicals, deemed to encompass most of the critical chemicals in terms of quantity of shipment and the severity of the hazards presented, were associated with each of approximately 30 amelioration categories. A representative chemical was then selected for each category with the intent that it would provide the basis for searching for, evaluating, and developing amelioration methods from each category. The representative chemicals were chosen by assessing the chemical and physical behavior of the chemicals, risk indices, and other practical considerations. Existing response (amelioration) equipment and systems were then

reviewed to determine applicability to each representative chemical and its associate category. Once gaps and deficiencies were determined, conceptual response studies were initiated that resulted in a number of potential amelioration techniques that were considered to warrant USCG-sponsored research and development efforts. (Katz)
W76-01902

A COMPARISON OF FOUR SAMPLERS FOR BENTHIC MACROINVERTEBRATES INHABITING COARSE RIVER DEPOSITS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 7B.
W76-01909

CHEMICAL ANALYSIS OF TRACE ELEMENTS IN ICELAND GEYSIRS WITH REMARKS ON MASTIGOCLADUS LAMINOSUS COHN,
Copenhagen Univ. (Denmark). Inst. of Hygiene.
E. Fjerdingstad, K. Kemp, and E. Fjerdingstad.
Archiv fur Hydrobiologie, Vol 74, No 2, p 159-171, October 1974. 10 fig, 3 tab, 39 ref.

Descriptors: *Trace elements, *Algae, *Geysers, Thermal water, *Thermal springs, Spectroscopy, *Chemical analysis, Copper, Zinc, Manganese, Metals, Silica, Iron, Chlorine, Plant morphology, Hot springs, Cyanophyta, Methodology.
Identifiers: *Mastigocladus laminosus, *Transition metals, Bioaccumulation, *Iceland, Geysirs.

Water from Iceland geysers and the dominant thermal alga, Mastigocladus laminosus were investigated for trace elements. Great concentrations of Si, Ca, Fe and Cl were found in both water and algae. The accumulation factors for Cu, Zn, Mn and Ti were high in the algae, while small concentrations were found in the water. It is suggested that these transition metals are of vital importance to the organisms and are probably part of their enzymatic make-up. The morphology of the algae is discussed. (Katz)
W76-01912

TRACER EXPERIMENTS ON THE EFFECT OF MICRONUTRIENTS ON THE GROWTH OF PORPHYRA PLANTS-II MANGANESE-54 AND ZINC-65 ASSIMILATION IN RELATION TO ENVIRONMENTAL FACTORS,
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
For primary bibliographic entry see Field 5C.
W76-01916

A RESPIROMETER TECHNIQUE FOR EVALUATING THE POTENTIAL EFFECTS OF RAPID THERMAL CHANGES TO SMALL AQUATIC ORGANISMS,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
For primary bibliographic entry see Field 5C.
W76-01920

A SALINITY CONTROLLER FOR FLOW-THROUGH BIOASSAYS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
L. H. Bahner, and D. R. Nimmo.
Transactions of the American Fisheries Society, No 2, p 388-389, 1975. 2 fig.

Descriptors: *Design, *Methodology, Technology, *Bioassays, Flow systems, *Salinity, Water quality, Pesticides, Sea water, *Pollutant identification, *Bioassay, Instrumentation.
Identifiers: *Electro-Mechanical device.

An electro-mechanical device was constructed to monitor and dilute seawater to a constant salinity for flow-through bioassays. It was used successfully in pesticide bioassays and required little maintenance. (Klein)
W76-01929

AN ULTRAVIOLET SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF NAPHTHALENE AND ALKYLNAPHTHALENES IN THE TISSUES OF OIL CONTAMINATED MARINE ANIMALS,
Texas A and M Univ., College Station. Dept. of Biology.
J. M. Neff, and J. W. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 1, p 122-129, July 1975, 1 fig, 2 tab, 15 ref.

Descriptors: Methodology, *Analytical techniques, *Spectrophotometry, *Oil pollution, Organic compounds, *Marine animals, Animal physiology, Clams, Oysters, Mollusks, Technology, *Pollutant identification.
Identifiers: Ultraviolet spectrophotometry, *Naphthalene, Methylnaphthalenes, Dimethylnaphthalenes, Bioaccumulation, Tissue analysis, Crassostrea virginica, Rangia cuneata, *Alkylnaphthalenes.

A direct UV spectrophotometric method for the semiquantitative determination of naphthalene, methylnaphthalenes and dimethylnaphthalenes in oil polluted sea water and the tissues of marine animals is presented. Oysters, Crassostrea virginica, and clams, Rangia cuneata, were used. As little as 0.1 ppm of naphthalene and alkylnaphthalenes were detected in tissues. The detection limits in sea water ranged from 0.01 to 0.05 ppm. (Klein)
W76-01933

5B. Sources Of Pollution

CHEMICAL AND SEDIMENT BUDGETS FOR A SMALL TIDAL CREEK, CHARLESTON HARBOR, S. C.,
South Carolina Univ., Columbus. Dept. of Geology.
J. L. Settlemyre, and L. R. Gardner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-081, $4.50 in paper copy, $2.25 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No 57, May 1975, 56 p, 9 fig, 10 tab, 60 ref. OWRT B-055-SC(4).

Descriptors: *Tidal marshes, *Estuaries, *Sediments, *Water quality, Nutrients, Metals, Surfactants, Coliforms, Organic matter, *South Carolina, Harbors.
Identifiers: *Charleston Harbor(SC), Chemical budgets, Sediment budgets.

Chemical and sediment budgets based on discharge weighted composite samples of flood and ebb flow over 25 tidal cycles indicate that marshes export suspended organic matter and dissolved Si02, P04 and perhaps Fe. Inorganic sediment, surfactants and possibly coliform bacteria are imported and/or degraded. No significant net transport was detected for dissolved Cu, Zn or Pb. The methodology and results of the study are evaluated in terms of physical, chemical and biological processes operative in marshes and in terms of ecological constraints.
W76-01511

EVALUATION OF THE EFFECTS OF URBANIZATION ON AQUATIC ECOLOGY AND HYDROLOGIC REGIMES.
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4C.
W76-01514

THREE-DIMENSIONAL SIMULATION THERMALLY-INFLUENCED HYDRODYNA IC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineerin
L. D. Spraggs, and R. L. Street
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB247-0 $10.00 in paper copy, $2.25 in microfiche. Tech cal Report No 190, August 1975, 327 p, 83 fig, tab, 48 ref, 5 append. OWRT C-3033(No. 3675)

Descriptors: *Thermal pollution, *Lakes, C puter programs, *Computer models, *Reservo *Numerical analysis, Digital comput *Simulation analysis, Circulation, Ther stratification.

A study was undertaken to develop a three-dim sional numerical model for prediction of the t perature regime and energy transfers in bodie water subjected to thermal loadings. The Nav Stokes equations, a heat energy equation, a p sure equation and a continuity equation are n dimensionalized using three-characteristic le scales. Hence, all physical problems are trea numerically, and mathematically, inside a cube. The Boussinesq approximation is used density variations. Sub-grid-scale turbulence si lation is used with an eddy viscosity hypothe The numerical model follows a Marker-and-C style format in variable placement, etc., was co in FORTRAN, and was implemented on I 360/168 and CDC/7600 computers. Many probl were successfully simulated, including labora tests with wind and in/out flows, and ideal lake forms.
W76-01518

ESTIMATION OF URBAN STORMWA QUALITY IN KALIHI STREAM DRAIN BASIN, OAHU, HAWAII,
Hawaii Univ., Honolulu, Water Resou Research Center.
M. N. Nakamura, and R. H. F. Young.
Available from the National Technical Info tion Service, Springfield, Va 22161, as PB-247 $4.00 in paper copy, $2.25 in microfiche. Tech Memorandum No 45, December 1974. 39 p, 8 16 tab, 41 ref. OWRT A-027-HI(4) 14-31-0 3811.

Descriptors: *Storm runoff, *Pollutant identi tion, *Rainfall intensity, *Land use, Urbaniza *Drainage basin, Isohyets, *Hawaii, Estimatin
Identifiers: *Rainfall duration, Street wa Seasonal storm analysis, *Stormwater qua Kalihi Stream drainage basin(Hawaii).

Urban runoff pollution potential can be link the constituents of street wastes as these w constitute the principal portion of runoff cont nants. This study was an attempt to correlate lution associated with street litter with bas quality data acquired in a previous study of K Stream. Correlations were made between s sweepings quality, length of street, land use, s surface characteristics, and rainfall intensi order to estimate the concentration of pollutan urban stormwater. The overall comparabili obtained estimated with existent stormwater q ty data suggests the possibility of obtaining acceptable quantification of pollution potenti tributable to urban runoff by utilizing proce described. However, the number of assump required leads to some inadequacies as reflect inconsistencies in predicted BOD5 and COD l with actual field data. The good correlatio population density-based formulae for length with actual street lengths indicates a s method for approximating street refuse poll based on loadings per length of curb.
W76-01525

INDUSTRIAL POLLUTION OF THE LO MISSISSIPPI RIVER IN LOUISIANA.
Environmental Protection Agency, Dallas, Surveillance and Analysis Div.

ilable from the National Technical Informa- Service, Springfield, Va 22161, as PB-229 814, 75 in paper copy, $2.25 in microfiche. Report, il 1972. 146 p, 2 fig, 20 tab, 72 ref, 1 append.

scriptors: *Industrial wastes, *Mississippi er, *Louisiana, *Water quality, Industrial nts, Industrial water, Industries, Water pollu-, Water pollution sources, Water chemistry, lutants, Pollutant identification, Chemical stes, Heavy metals, Toxicity, Organic com- nds, Taste, Odor, Fish, Water quality stan- ds, Water quality standards, Water quality con- .

ntifiers: Carcinogenic compounds.

ste waters from 60 industries discharging to the ssissippi River from the Baton Rouge area to its uth have been analyzed and found to contain anic chemicals and toxic metals in high concen- tions. Municipal water supplies were found to ntain organic compounds in trace amounts ich are believed to be the cause of the off- vors in these supplies, and which may present a tential threat to the health and wellbeing of the nsumers. Fish exposed to the river water veloped objectionable tastes within seventy-two urs. Violations of taste and odor criteria in the er and in fish flesh were identified. Analytical hniques used were described in an appendix. ms-ISWS)
76-01532

ERCURY DISTRIBUTION IN ANCIENT AND ODERN SEDIMENT OF NORTHEASTERN RING SEA,
ological Survey, Menlo Park, Calif.
H. Nelson, D. E. Pierce, K. W. Leong, and F. F. Wang.
arine Geology, Vol 18, No 2, p 91-104, Februa- , 1975. 5 fig, 4 tab, 27 ref.

escriptors: *Mercury, *Sediments, *Alaska, eans, Beaches, Path of pollutants, Sediment stribution, Sampling, Core drilling, Evaluation, eologic time, Pleistocene epoch.
entifiers: *Bering Sea, Ancient and modern sedi- ents.

econnaissance sampling of surface and subsur- ce sediment to a maximum depth of 80 m below e sea floor that typical values of 0.03 mg/litre nd anomalies of 0.2-1.3 mg/litre mercury have een present in northeastern Bering Sea since arly Pliocene time. Values are highest in modern each (maximum 1.3 and mean 0.22 mg/litre Hg) nd nearshore subsurface gravels (maximum 0.6 nd mean 0.06 mg/litre Hg) along the highly ineralized Seward Peninsula and in clayey silt ch in organic matter (maximum 0.16 and mean 10 mg/litre Hg) throughout the region. Although old mining may be partly responsible for high ercury levels in the modern beach near Nome, laska (maximum 0.45 mg/litre), equally high or reater concentrations of mercury occur in buried leistocene sediments immediately offshore naximum 0.6 mg/litre) and in modern unpolluted each sediments at Bluff (maximum 1.3 mg/litre); his suggests that the contamination effects of ining may be no greater than natural concentra- on processes in the Seward Peninsula region. Woodard-USGS)
W76-01586

N INTRODUCTION TO THE PROCESSES, ROBLEMS, AND MANAGEMENT OF URBAN AKES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2H.
W76-01588

THE MIGRATION OF FLY LARVAE (SIMULIIDAE) IN WATER WITH HIGH LEVELS OF TURBIDITY(IN RUSSIAN).
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 2I.
W76-01615

DEVELOPMENT AND ECOLOGY OF SKUJA IN THE SWEDISH LAKE TRUMMEN,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 2H.
W76-01621

INTERCEPTING TRENCH AT A LANDFILL RENDERS LEACHATE INTO DRINKABLE SOURCE OF WATER,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-01627

KINETICS OF LIMESTONE DISSOLUTION BY ACID WASTE WATERS,
Pennsylvania State Univ., University Park. Mineral Processing Section.
For primary bibliographic entry see Field 5D.
W76-01643

SOURCES AND DISTRIBUTION OF TRACE METALS IN AQUATIC ENVIRONMENTS,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
S. L. Williams, D. B. Aulenbach, and N. L. Clesceri.
FWI Report 74-25. 50 p, 27 tab, 8 ref, Published in 'Aqueous-Environmental Chemistry of Metals,' Alan J. Rubin, ed, Ann Arbor Science Publishers, Inc., Michigan.

Descriptors: *Path of pollutants, *Trace elements, *Metals, *Distribution, Geology, Titanium, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Soils, Rocks, Litter, Atmospheric fallout, Sediments, Precipitation(Atmospheric), Chemical reactions, Biochemistry, Surface waters, Hydrogen ion concentration, Urban runoff, Humus.
Identifiers: *Trace metals sources, Scandium, Vanadium.

Sources of trace metals (scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper and zinc) in aquatic environments are rocks, soil, and plant litter of drainage basins, dry and wet atmospheric fallout, and industrial and municipal discharges. Metal concentrations depend on the source and chemical and biological nature of receiving waters. Oligotrophic mountain lakes and streams generally contain more metals in surface waters than slower-moving waters with highpH and dissolved salt concentrations. The higher metal concentrations are usually due to larger quantities of humic substances which solubilize metals and to low quantities of dissolved salts which precipitate metals. Streams flowing through sedimentary limestone regions often pick up more metal by erosion or leaching than streams flowing over granite. High local metal concentrations often occur in eutrophic, polluted waters due to acid or strong reducing environments coupled with metal introduction from sediments exposed to reducing environments or from industrial and municipal discharges. High local metal concentrations decrease with distance from polluting source due to chemical and biological reactions. Metal concentrations in oligotrophic, eutrophic, and polluted rivers and lakes in the United States and foreign countries are given to illustrate their occurrence in surface waters. (Buchanan-Davidson--Wisconsin)
W76-01651

PERSISTENCE OF ENDOTHALL IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
G. V. Simsiman, and G. Chesters.
Water, Air, and Soil Pollution, Vol 4, p 399-413, 1975, 4 fig, 2 tab, 27 ref. OWRR B-016-WIS (17).

Descriptors: *Herbicides, *Aquatic environment, *Persistence, Microbial degradation, Pesticide removal, Dissolved oxygen, Aquatic weed control, Sediments, Pesticide kinetics, Adsorption, *Wisconsin.
Identifiers: *Endothall, Lake Mendota(Wis), Lake Tomahawk(Wis).

In a simulated lake impoundment, 72% of the added endothall persisted in the water for 30 days due to prolonged dissolved oxygen depletion resulting from weedkill. Endothall disappeared rapidly only after restoration of oxygenated and oxydizing conditions; under such conditions little or no endothall was detectable after 60 days. Degradation of endothall was slow in weed-free and quiescent sediment-waters containing abundant overlying water (200 ml water:5 ml sediment), even under aerobic conditions. Slow degradation was detected by the small amount of radioactive carbon dioxide evolution and persistence of intact endothall in the water after two months. When the water volume was reduced (20 ml water:5 ml sediment), there was a 25-fold increase in endothall degradation in Lake Mendota, Wisconsin, (a eutrophic hard-water lake). In Lake Tomahawk (an oligotrophic soft-water lake) degradation was slow, indicating that either the sediment contained low numbers of endothall-degrading microorganisms or rapid adsorption decreased herbicide availability for microbial decomposition. This study demonstrates that endothall--although degradable microbiologically--can persist in heavily weed-infested waters if anaerobiosis limits the activity of microorganisms. This may be a significant consideration when treating heavily weed-infested ponds or lakes into with endothall where complete stripping of DO is likely to occur. (Buchanan-Davidson--Wisconsin)
W76-01658

EVALUATION OF GEOTHERMAL ACTIVITY IN THE TRUCKEE MEADOWS, WASHOE COUNTY, NEVADA,
Nevada Univ., Las Vegas. Center for Water Resources Research.
R. L. Bateman, and R. B. Scheibach.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 297, $4.00 in paper copy, $2.25 in microfiche. Nevada Bureau of Mines and Geology, Report No 25, 1975. 38 p, 22 fig, 4 tab, 33 ref, 2 append. Published by Mackay School of Mines, Univ of Nevada, Reno. OWRT A-056-NEV (1) 14-31-0001-4028.

Descriptors: Thermal Springs, *Geothermal studies, *Thermal water, Trace elements, *Nevada, Evaluation, Groundwater, Wells, Beneficial use.
Identifiers: *Truckee Meadows(Nev).

This study describes occurrences of geothermal activity within Truckee Meadows area of Washoe County, Nevada, and discusses the potential for utilizing geothermal resources for residential heating. Probable effects of thermal waters on overall ground-water conditions under a pattern of increasing development within the basin are estimated. All chemical quality and temperature data for thermal and non-thermal ground waters were assembled and subjected to various forms of analysis. Results were used to precisely delineate areas of geothermal occurrence and assess the probable results of induced mixing of poor-quality thermal and good-quality non-thermal ground waters. Past and present utilization of the local geothermal resource were inventoried and evaluated. The most freqent present use is for single residence heating employing geothermal wells and simple heat-exchanger systems. Approximately 32 dwelling units and 3 commerical buildings are heated in this manner. This research indicates that space heating is the most practical beneficial use of the geothermal resources in the Truckee Meadows, and that further expansion of this use is

feasible under present technology. (Fallon-Nevada)
W76-01683

HEAVY METAL (CU, PB, ZN, CD, NI, AS, HG) ADDITIONS TO SURFACE WATERS, STREAMS SEDIMENTS AND SELECTED AQUATIC LIFE IN THE MERAMEC PARK RESERVOIR DRAINAGE BASIN, MISSOURI,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
P. D. Proctor, T. Butz, and B. Sinha.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 310, $4.50 in paper copy, $2.25 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, July 29, 1975. 44 p, 5 fig, 17 tab, 17 ref, 5 append. OWRT A-072-MO (1) 14-31-0001-4025 and 5025.

Descriptors: *Heavy metals, *Water quality, Surface waters, *Sediments, Aquatic life, Copper, Lead, Zinc, Cadmium, Nickel, Arsenic, Mercury, *Missouri, Reservoirs, *Path of pollutants, *Pollutant identification.
Identifiers: *Meramec River(Mo), *New Lead Belt(Mo), Meramec Park Reservoir Basin(Mo), Barite, Galena.

Heavy metal content of surface waters, stream and bank sediments, and selected aquatic life were determined for five distinct drainage areas in the 1475 square mile Upper Meramec River Basin. A planned reservoir will recieve water and sediments from fringe mining areas producing lead, copper, zinc, cadmium, and barite. Heavy metal content in surface waters is in low parts per billion and mainly meets US Public Health Service standards for drinking water. Cadmium locally approaches the upper limit of 10 ppb at six sample sites. Lead and cadmium content in waters are highest in drainage from the New Lead Belt fringe. Mercury is less than 0.1 ppb for all areas. Two sets of stream sediments from 55 and 69 sample sites, respectively, were analyzed for acid leachable heavy metal content. Leachable heavy metal con tent is several orders of magnitude greater than for water, except for mercury. The sediments from the fringe of the New Lead Belt have the highest average content of lead, copper, zinc, cadmium and nickel. Highest anomalous values occur in this same drainage area, followed by sediments from the fringe of a barite - galena mining area on the east of the basin. Selected aquatic life has heavy metal content and distribution patterns similar to the stream sediments. Effect of entrapment of acid leachable heavy metal content in stream sediments in a reservoir environment is unknown, as also the effect on associated plants and food-chain relationship to other organisms. Monitoring of the water-sediment environment is recommended when and if the reservoir is completed.
W76-01686

THE EFFECTS OF REGIONAL DEVELOPMENT ON THE ILLINOIS RIVER ENVIRONMENT,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
R. N. DeVries, and D. F. Kincannon.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 279, $6.75 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1975). 164 p, 37 fig, 25 tab, 56 ref, 3 append. OWRT A-058-OKLA (1) 14-31-0001-5036.

Descriptors: *Water quality, *Land use, *Waste assimilation capacity, Oklahoma, Arkansas, *Regional development, Low flow, Data collections, Model studies, Water pollution sources.
Identifiers: *Illinois River(Okla-Ark).

Little water-quality data exist for the scenic and popular Illinois River Basin in Oklahoma and Arkansas, making it impossible to predict the impact of regional developments on the basin. Preliminary studies were made to determine the water quality and quantity characteristics of the river and its tributaries, the assimilative capacity of the river, and the present land use pattern. A statistical analysis of the low flows at gaging stations on the Illinois River, Flint Creek and the Barron Fork was made. Allowable organic waste loadings were investigated and modeled. The National Weather Service River Forecast System's streamflow simulation model was fit to the existing basin data. This model will be used in future studies to determine the correlation between quality and quantity. All available water quality data were analyzed along with additional field quality data obtained in 1975 at selected locations. Land use information was obtained using ERTS. The present water quality of the basin is excellent. In order to maintain this quality, models must be developed to predict environmental changes that result from development within the basin.
W76-01690

FATE OF NITROGEN IN SEWAGE EFFLUENT APPLIED TO SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. C. Lance.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR 3, p 131-0144, September, 1975. 2 fig, 1 tab, 32 ref.

Descriptors: *Nitrogen, *Nutrient removal, *Sewage disposal, *Sewage effluents, *Water reuse, Nitrogen compounds, Fertilizers, Environmental sanitation, Sewage treatment, Waste water disposal, Sanitary engineering, Sewage, Filtration, Water conservation, Irrigation water, Water spreading, Irrigation, Infiltration.

Sewage water is generally applied to land in 3 types of application systems: low-rate or irrigation systems, high-rate land filtration, and overland flow or spray-runoff. Each of these systems will remove nitrogen from wastewater if the right soil is selected and the system is properly managed. If areas of crop land are located near the treatment plant, the sewage effluent nutrients can help pay for the treatment. Nitrogen can be removed with a much smaller land area by using a high-rate land filtration system and managing it to promote denitrification. Sewage water could also be applied at high infiltration rates, removing most of the organic matter and harmful microorganisms but not the nitrogen, and then be collected with drains or pumped from the groundwater for unrestricted irrigation use. The overland flow system can be used on soils with a very low permeability where no other land treatment could be used. It could also be used as the sole sewage treatment for some small communities. (Robinett-Arizona)
W76-01696

SOURCES OF POLLUTION FROM MILITARY INSTALLATIONS, PART II,
Rensselaer Polytechnic Inst., Troy, N.Y.
L. K. Wang, J. G. Michalovic, R. G. Ross, and V. J. Ciccone.
Water and Sewage Works, Vol 122, No 8, p 69-71, August, 1975. 12 tab, 21 ref.

Descriptors: *Waste water(Pollution), *Water pollution sources, *Pollutant identification, Oil, Detergents, Storm runoff, Phenols, Chemical oxygen demand, Biochemical oxygen demand, Mathematical estimating equations, Flow rates.
Identifiers: *Military installations, Combined wastes, *Air Force bases, Washrack waste water, Total organic carbon(TOC).

Various waste water streams generated from military bases were analyzed and identified. Washrack waste waters are divided into two separate groups: materials in dirt films, such as soil, grease and oil; and detergents, soaps and solvents. General characteristics of waste waters are very similar despite the wide variability in differences of operation from installation to installation. Characteristics of various combined waste streams were studied. The chemical composition of a specific combined waste stream can be mathematically estimated if the quantity and the percent flow of each participating stream are known. Flow meters can be used to measure the flows of each participating waste stream at different times of day so that the combined waste waters may be estimated. The feasibility of this is subject to further field investigations. (Pinto-FIRL)
W76-01763

WATER RENOVATION USING DEEP NATURAL SAND BEDS,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5D.
W76-01765

CONTAMINANTS IN RAINWATER AND THEIR RELATION TO WATER QUALITY, PART I,
Suffolk County Dept. of Environmental Control, N.Y.
J. A. Frizzola, and J. H. Baier.
Water and Sewage Works, Vol 122, No 8, p 72-7 August, 1975. 1 fig, 2 tab.

Descriptors: *Rainwater, *Groundwater, *Water quality, Evapotranspiration, Pollutants, New York, Precipitation(Atmospheric), Analytic techniques, Water pollution sources, Water pollution effects.
Identifiers: Long Island(NY).

The effect of rainwater quality on groundwater Long Island is discussed. Long Island's sole wat supply is groundwater, and the sole source of t groundwater is precipitation. Under natural con tions, about 50% of the precipitation is lost, main due to evapotranspiration, before it could becor groundwater. The final quality of the groundwat is due not only to trace substances that may picked up by rainwater in the atmosphere, but al by the hydrogeological processes that take pla between the surface and the saturation point of t ground. Natural processes include: evapotrai piration, absorption, adsorption, and ic exchange. Unnatural processes, termed polluti effects, include sources such as fertilizers, ce pools, leachate, and urban runoff. Precipitati study has experienced a resurgence lately, and t U.S. Geological Survey has developed a netwo of testing stations in New York State. The two s tions discussed are Mineola and Upton in Lo Island. To investigate the effects of lawn a garden fertilizers on groundwater the Suff County Department of Environmental Control up a testing station at Medford, which is a t area. Two types of samples are taken: a b monthly sample, and a sample of each precip tion event. Data analyses of samples were c cerned with pH, nitrate, ammonia, sulfate, to nitrogen and chloride to sodium ion ratios, al with other ion tests. (Pinto-FIRL)
W76-01769

TRACE METALS IN MELBOURNE RIVERS- INTERLABORATORY ANALYSIS,
Materials Research Labs., Ascot Vale (Australi
For primary bibliographic entry see Field 5A.
W76-01770

SIMULATION OF BOD AND DO BALAN WITH RESPECT TO A POLLUTED SHALL RIVER (PART I): MATHEMATICAL MODEL
S. Aiba, M. Okada, H. Otake, R. Sudo, and T. Mori.
Gesuido Kyokaishi, (Journal of Japan Sew Works Association), Vol 12, No 131, p 33 April, 1975. 5 fig, 11 ref.

scriptors: *Biochemical oxygen demand, vers, *Pollutant identification, *Model studies, mulation analysis, *Dissolved oxygen, athematical models, Algae, Flow characstics.

hysical-mathematical model was derived for an river systems, emphasizing the effects of ie on biochemical oxygen demand and disved oxygen. The model was particularly igned for shallow and narrow rivers such as se in Japan. Quantitative analyses of daily iation of dissolved oxygen by algae and of ond stage BOD were performed. Second stage D was determined by the adsorption structure algae, water velocity, water temperature, and quantity of the adsorbed algae on the river bed. e overall rate of photosynthesis of algae and the piration rate were determined by illumination l dissolved oxygen, respectively, and by conits which depend on the physiological condiis of the algae. The physical-mathematical dels for BOD and DO balances were then rived by using the above parameters and the w conditions of the river. (Su-FIRL)
76-01777

PRESENTATION OF MACROSCOPIC FLOW AN AERATION BASIN BY A CASCADE RMED BY TWO UNEQUAL PERFECT MIXS (REPRESENTATION DE L'ECOULEMENT ACROSCOPIC DANS UN BASSIN AERATION PAR UNE CASCADE DE DEUX ELANGEURS PARFAITS INEGAUX),
ontpellier-2 Univ., (France). Laboratoire de nie Chimique.
r primary bibliographic entry see Field 5D.
76-01778

LASSIFICATION OF MODELS TO TIDAL ATERS,
onash Univ., Clayton (Australia). Dept. of echanical Engineering.
B. Hinwood, and I. G. Wallis.
urnal of the Hydraulics Division, Proceedings of merican Society of Civil Engineerers, Vol 101, o HY10, p 1315-1331, October, 1975. 1 tab, 141 f.

escriptors: *Waste water disposal, *Mixing, Mathematical models, *Estuaries, Classification, ath of pollutants, Water pollution sources.

he development and direction of a water quality rogram for estuaries and tidal inlets requires a odel to predict the mixing and movement of astes discharged into the water. The models vailable are discussed in terms of the representaons and simplifications used, and the range of onditions under which each model is satisfactory. he models all assume the wastes are miscible eutrally buoyant. The three general approaches o modelling water and waste movement include hysical hydraulic models, passive electrical nalog, and mathematical models. A numerical olution of the partial differential equations that escribe water movement and pollutant transport usually the most productive model. Only numerical models are considered in this discussion. The lassification scheme presented is based on the umber of spatial dimensions, the reference frame sed, and the degree to which the hydrodynamic rocesses are included in any model. The factors overning the choice of a model for a particular inestigation include: the use to be made of the nodel as part of the total investigation; the esources available for the study; the nature of the wastes; and, the nature of the estuary and its oundaries. The answers to these questions permit he selection of the appropriate type of model. The lassification table will then indicate the models vailable to meet the requirements of the physical situation. (Orr-FIRL)
W76-01780

THE SIGNIFICANCE OF HYDROGEN SULFIDE IN GROUNDWATER,
E. C. C. Li.
Water and Sewage Works, Vol 122, No 8, p 66-67, August, 1975. 3 tab, 8 ref.

Descriptors: *Anaerobic conditions, *Anaerobic bacteria, *Groundwater, *Analytical techniques, *Hydrogen sulfide, Sulfides, Sulfates, Groundwater resources, Leaching, Water pollution sources, Water quality, Landfills.

Hydrogen sulfide is found in groundwater mainly as a result of anaerobic sulfate reductions. An analysis was made of the concentrations of sulfide in groundwater. Three drilled wells in Oklahoma were sampled; these were located within a sanitary landfill, 0.7 miles upstream from the landfill site, and one mile downstream from the site. Water and mud were collected and analyzed for chemical parameters and for the presence of sulfate-reducing bacteria. It was found that landfill groundwater and downstream groundwater were in reducing states with an anaerobic environment; upstream groundwater was also in a reducing state and had a micro-aerophilic environment. A relatively high concentration of dissolved sulfate was found in the landfill groundwater, indicating that decomposed products containing large quantities of sulfate in the landfill were leaching into the groundwater. Analysis of bottom muds showed that sulfide sulfur was dominant, particularly in the landfill sample and was associated with dissimilatory sulfate reducing bacteria that exist only under strict anaerobic conditions. Since organic matter stagnated and accumulated in the landfill area, most sulfate reduction occurred near the mud surface, causing serious pollution at that location. (Kramer-FIRL)
W76-01781

SOME ENVIRONMENTAL PROBLEMS AND THEIR SATELLITE MONITORING,
Tel Aviv Univ., (Israel). Dept. of Environmental Sciences.
J. Otterman.
Journal of the British Interplanetary Society, Vol 28, No 9/10, September/October, 1975. 5 fig, 38 ref.

Descriptors: *Satellites(Artificial), *Monitoring, Surface waters, Water pollution sources, Oil spills, Land use, Water pollution control, Waste treatment.
Identifiers: Albedo.

Results from the first Earth Resources Technology Satellite in monitoring land and water surface changes are presented. Previous studies utilizing this type of satellite and its imagery have been performed in the fields of agriculture, forestry, hydrology, oceanography, limnology, and pollution studies. The possibilities of modifying the sensors of the ERTS (LANDSAT) series satellites for appropriate environmental monitoring are discussed. Some of the dangers linked to land use pressures and surface pollution, such as climatic modification and severe regional environmental impact, are surveyed. Two areas for which monitoring is necessary are: the determination of land use changes due to overgrazing and how such changes affect albedo and land surface-atmosphere interactions; and the determination of land and water surface pollution, particularly the detection of oil slicks. Satellite monitoring is proposed both for assessing the land use and pollution situations and for introducing and following remedial procedures. (Kramer-FIRL)
W76-01791

WATER QUALITY STUDIES AND LAND-USE MAPPING USING ERTS-1 DATA,
Lund Univ. (Sweden). Dept. of Geography.
For primary bibliographic entry see Field 5A.
W76-01792

THE ROLE OF PLANT RESIDUES IN THE RETENTION OF CADMIUM IN ECOSYSTEMS,
Delaware Univ., Newark. Dept. of Biological Sciences.
G. F. Somers.
Available from the National Technical Information Services, Springfield, Va 22161 as PB-247 556, $4.00 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 24 p, 2 fig, 6 tab, 5 ref. OWRT A-032-DEL(1).

Descriptors: *Cadmium, Forests, *Decomposing organic matter, *Adsorption, *Plant physiology, Water pollution, Ecosystems, *Degradation(Decomposition), Assay.

Both fresh and partially decomposed residues of plant material from an old field, a deciduous hardwood forest and from under pine trees exhibited a high affinity of Cd++. The samples were dried and the degree of adsorption of Cd++ was assayed using 109Cd. Using the theory of multiple equilibria (Klotz, 1953) the total number of Cd-binding sites (n) and the intrinsic association constant (K) were determined. These appeared to fall into two classes with lower values for n and higher ones for K at concentrations of <3x10-4 M Cd++ and the converse being true at higher concentrations of Cd++. Changes in the magnitude of n with litter decomposition appeared to be associated to some degree with changes in 'cellulose' and 'lignin' content. The total quantity of exchange sites corresponded to from 0.016 to 0.331 moles Cd/m2 depending upon source of litter and degree of decompition. It is suggested that such material could have a substantial role in smoothing out ambient surges in Cd++ pollution.
W76-01813

REMOTE SENSING OF COAL MINE POLLUTION IN THE UPPER POTOMAC RIVER BASIN.
Ambionics, Inc., Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161, as N74-34817, $4.50 in paper copy, $2.25 in microfiche. NASA Report CR-132529, 1974. 67 p, 7 fig, 6 ref. NASA NAS-1-12673.

Descriptors: *Remoting sensing, *Water pollution sources, *Coal mines, *Mine waste, Mine drainage, Mine acids, Mine water, Acid mine water, Strip mines, Strip mine wastes, Vegetation, Pollutant identification, Satellites(Artificial), Aerial photography, Surveys, *Potomac River.
Identifiers: *ERTS.

The purpose of the program was to investigate the utility of combining data sensed remotely from satellites and aircraft with those obtained by traditional field methods of surface sampling, in a more effective approach to monitoring water pollution caused by mining activities, both active and abandoned. The sparsely settled reaches of the upper Potomac River was selected as the test site. The area is almost devoid of industry except coal mining, lessening the confusing effects of other contributing pollution sources. Active teams of scientists live and work in the area who have provided data on the history, land use practices, all polluting agencies, and the effects of pollution. Sufficient work has been done to determine that while remote sensing in no way obviates the need for traditional grab sample monitoring, in can provide a method for correlating, refining, and making more efficient a total monitoring program. Limitations found included the high probability that the test site will be obscured by clouds or haze during an overflight. (Sims-ISWS)
W76-01831

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, APPENDIX II,
Ocean Systems, Inc., Reston, Va.
For primary bibliographic entry see Field 5G.
W76-01835

OIL/WATER TANK CONTENT PROFILES,
Exxon Research and Engineering Co., Florham Park, N.J.
For primary bibliographic entry see Field 5A.
W76-01837

FEASIBILITY OF REMOTE SENSING FOR DETECTING THERMAL POLLUTION--PART I: FEASIBILITY STUDY; PART II: IMPLEMENTATION PLAN,
Miami Univ. Coral Gables, Fa. Dept. of Mechanical and Industrial Engineering.
For primary bibliographic entry see Field 5A.
W76-01838

DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING THERMAL INFRARED IMAGERY,
Alabama Univ., Huntsville. Center for Environmental Studies.
F. L. Doyle.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-12546, $3.50 in paper copy, $2.25 in microfiche. Interim Report to National Aeronautics and Space Administration, October 31, 1974. 14 p, 4 fig, 5 ref, 1 append. NASA NAS8-30216.

Descriptors: *Remote sensing, *Fractures(Geologic), *Soil moisture, *Thermal radiation, Infrared radiation, Temperature, Limestones, Wastes, Water pollution, Regolith, Bedrock, Aquifers, Soil texture, Weathering, Vegetation, Instrumentation, Density, Fourier analysis, Topography, Thermal capacty.
Identifiers: Hybrid optical/digital data processor, Laser beam, Horizontal bar filter, Imagery, Enhancement.

Research is being conducted to find applications of remote-sensing techniques to groundwater hydrology. The effect of soil moisture on surface temperature and the relationship between soil moisture and groundwater is being investigated. Thermal differences at the earth's surface were recorded over the southwestern part of Madison County and adjacent Limestone and Morgan Counties, Alabama, by a Bendix LN 2 thermal scanner. Relative temperature differences between adjacent areas were evidenced by light and dark gray hues, cooler area being darker and warmer areas lighter. Entry of contaminants into the limestone aquifer is more likely to occur where solution has occured, such as along bedding planes or fractures. In north Alabama, however, the overburden is usually several tens of feet thick, and solution openings are hidden. A moisture differential will exist in the soil profile above a solution opening, as opposed to the profile above and area where no solution opening is present. Ground truth data in the form of soil temperature and moisture was used to corroborate the information of the thermography. Recommended conditions for use of thermal imagery to detect maximum thermal contrast due to soil moisture were outlined. (Visocky-ISWS)
W76-01840

THE DISTRIBUTION OF EXCESS TEMPERATURE FROM THE VIENNA GENERATING STATION ON THE NANTICOKE RIVER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
H. H. Carter, and R. J. Regier.
Technical Report 90, Reference 75-5, June 1975. 60 p, 49 fig, 2 tab, 13 ref. ERDA AT(11-1)-3062.

Descriptors: *Thermal pollution, *Powerplants, *Cooling water, *Tidal streams, *Maryland, Temperature, Tides, Estuaries, Measurement, Analysis, Distribution, Path of pollutants, Velocity, Tracers, Diurnal distribution, On-site investigations, Water temperature, Heated water, Discharge(Water), Dye release.
Identifiers: *Nanticoke River(Md).

Temperature and dye tracer data, collected in the Nanticoke River in the vicinity of the Vienna Generating Station during April 1974, were analyzed and interpreted in terms of the distribution of excess temperature as a function of tidal phase. The extent and location of the thermal plume were determined. The analysis showed that over most of the estuary larger lateral temperature gradients resulted from differential solar heating than from the heated water discharge. Considerable recirculation was observed. The maximum recirculation of 24% was observed near the middle of the ebb cycle. Total cooling water flow was estimated from intake and discharge dye concentrations and was found to be about 87% of the rated pump capacity. (Adams-ISWS)
W76-01843

TURBULENT JETS WITH REVERSIBLE BUOYANCY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
S. C. Jain, and J. M. Pena.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY9, Paper 11586, p 1221-1233, September 1975. 6 fig, 16 ref. 3 append.

Descriptors: *Jets, *Heated water, *Turbulent flow, *Thermal pollution, *Lakes, Hydraulics, Analytical techniques, Freezing, Nozzles, Buoyancy, Heat transfer, Mixing, Water temperature, Discharge(Water), Density.
Identifiers: *Submerged jets, Momentum flux, Density deficiency profiles.

Large quantities of waste heat from electric power plants are discharged into natural bodies of water such as lakes, rivers, and oceans. The solutions derived from this study can be used to predict the behavior of warm submerged jets discharging into lakes during winter season when the ambient temperature of the lake is near the freezing mark. Due to the peculiar variation of the density of water at low temperatures, the behavior of a warm water jet is different from that of a buoyant jet in which the density can be assumed to be a linear function of the temperature. The problem was analyzed by employing the integral approach and assuming similarity conditions for velocity and temperature profiles. The nonlinear variation of density with temperature was included in the analysis. Results for the jet trajectory, width, and dilution were presented in graphical form. The jet trajectory was deflected downward for all the initial conditions examined. For the initial jet angles greater than zero, the jet rises to a maximum height due to initial vertical momentum and then starts sinking. The maximum rise of the jet is linearly proportional to the jet Froude number. (Singh-ISWS)
W76-01849

SOME EFFECTS OF CADMIUM ON CONIFEROUS FOREST SOIL/LITTER MICROCOSMS,
National Ecological Research Lab., Corvallis, Oreg.
H. Bond, R. Lighthart, R. Shimabuku, and L. Russell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 035, $4.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-036, June 1975. 30 p, 9 fig, 1 tab, 30 ref. 1AA006.

Descriptors: *Cadmium, *Coniferous forests, *Forest soils, *Litter, Oxygen, Carbon dioxide, Degradation(Decomposition).

Description and criticism are given of a preliminary design and use of a soil/litter microcosm in which oxygen, temperature and humidity are kept constant and oxygen generation and carbon dioxide and heat evolution rates are monitored. Experiments were performed using four microcosms, one acting as a dead control. For 'identically' prepared and incubated microcosms, the coeff cient of variation was as small as 3.8 percent f carbon dioxide evolution rate and as large as 9 percent for oxygen consumption rates. An adjus ment period of seven to ten days after microcos preparation was necessary to approach relative constant production rates. For microcosms a justed to 10, 30, and 60 percent of field water hol ing capacity, oxygen and carbon dioxide rates a bacterial densities vary directly whereas the fun and actinomycetes varied inversely. For 0.01 pp cadmium amended microcosms and initial stag in the 10 ppm CdCl2 unit, oxygen consumpti was stimulated suggesting respiratory enzyme u coupling while in the later stages the 10 ppm ca mium amended soils reduced both O2 and C respiration by 40 percent. No organismal dens changes due to cadmium were detected; longer e periments might be necessary to detect populati density changes. (EPA)
W76-01862

THE EFFECT OF MIREX AND CARBOFURA ON ESTUARINE MICROORGANISMS,
Mississippi State Univ., Mississippi State. Dept. Microbiology.
L. R. Brown, E. G. Alley, and D. W. Cook.
Environmental Protection Agency, Report EP 660/3-75-024, June, 1975. 47 p, 2 fig, 48 tab, 16 r 1 EA077. 68-03-0288.

Descriptors: *Estuarine environment, Adsorpti Microorganisms, Hydrolysis, Toxicity, *Path pollutants, Water pollution effects.
Identifiers: Chemical studies, Microcosm, A sorption fate, *Mirex, *Carbofuran.

The purpose was to help establish the chemi physical and micro-biological fate of mirex carbofuran in the estuarine environment determine the effect(s) on important estuar microorganisms and their activities. Chemical dies on the adsorption, fate and hydrolysis w conducted. The microbiological studies invol the use of both pure cultures and mixed culture a microcosm system and included twelve disti physiological groups of microorganisms. It concluded that neither mirex nor carbofu would have a deleterious effect on estuarine b teria under normal conditions, and there was evidence of bioaccumulation. Degradat products of both compounds were shown to toxic to some microorganisms. (EPA)
W76-01864

A STUDY OF LAGOONAL AND ESTUARI PROCESSES IN THE AREA OF MERR ISLAND ENCOMPASSING THE SPA CENTER--ANNUAL REPORT, 1 JUL. 1973 AUG. 1974.
Florida Inst. of Tech., Melbourne.
For primary bibliographic entry see Field 2L.
W76-01893

APPENDICES TO: SURVEY STUDY SELECT A LIMITED NUMBER HAZARDOUS MATERIALS TO DEF AMELIORATION REQUIREMENTS,
Little (Arthur D.) Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-01902

COMPARATIVE DISCHARGES OF FRESH A WASTE WATER ALONG THE CALIFOR COAST,
California Univ., Santa Cruz. Earth Scie Board.
G. B. Griggs, and P. A. McCrory.
Environmental Geology, Vol 1, No 2, p 89 1975. 3 fig, 7 ref.

Descriptors: *Coasts, *Water quality, *W water(Pollution), Effluents, Heated wa Sewage, Streamflow, Environmental effe California, *Thermal pollution.

fiers: *Coastal waters, *California coast.

0.75 x 10 to the sixth cubic meters of indus-aste water, 3.75 x 10 to the sixth cubic me- f domestic waste water, and 26.5 x 10 to the ubic meters of thermal effluents were found discharged daily into California's nearshore s. Waste water discharged near shore ned there for considerable time and had sig- nt effects on water quality and marine life. A excess of waste water over fresh water rge was observed. Many individual waste- discharges exceeded the average daily rge of most of the rivers which entered the l waters. (Klein)
01914

NSLOCATION OF HYDROCARBONS IN ATIC FOOD CHAINS,
rnia Univ., Davis. Dept. of Animal Physiolo-

rimary bibliographic entry see Field 5C.
01921

INE MEIOFAUNA OF A NEW YORK CITY CH WITH PARTICULAR REFERENCE TO DIGRADA,
Coll., New York. Dept. of Biology.
rimary bibliographic entry see Field 5C.
-01930

ECT ON DETERGENTS AND OF SPHO-GYPSUM ON THE OXYGEN AND OROPHYLL A LEVELS AND ON THE DRY GHT OF THE RESIDUE OF BRACKISH TER UNDER LABORATORY CONDITIONS,
ical Academy, Gdansk (Poland). Dept. of ogy.
primary bibliographic entry see Field 5C.
-01942

THE INFLUENCE OF SEWAGE POLLU- N ON INSHORE BENTHIC COMMUNITIES THE SOUTH OF KIEL BAY. PART I. ALITATIVE STUDIES ON INDICATOR SPE- S AND COMMUNITIES,
Univ., (West Germany). Zoologisches In- t.
primary bibliographic entry see Field 5C.
5-01944

NTHIC MEIOFAUNA AS INDICATOR OF YGEN CONDITIONS IN THE NORTHERN LTIC PROPER,
ckholm Univ. (Sweden). Asko Lab.; and ckholm Univ. (Sweden). Dept. of Zoology.
Elmgren.
Proceedings of the 3rd Baltic Symposium on rine Biology, Helsinki, No 239, p 265-271, 1975. g, 2 tab, 21 ref.

scriptors: *Biomass, *Bioindicators, *Benthic na, *Sampling, Oxygen, Bivalves, Copepodes, eciation, Population, Nematodes, Water pollu- n sources.
ntifiers: *Meiofauna, Water Zonation, *Baltic a.

e benthic meiofauna below 45 meters gave a ar and consistent zonation. In the upper zone of ntinuously higher oxygen content, a diverse and ndant meiofauna of high biomass occurred. In intermediate zone, the oxygen values fluctu- d greatly, owing to the oscillations of the prima- halocline. As the mean oxygen content creased gradually with depth, several taxa dis- peared successively from the meiofauna and ermediate to low biomass resulted. In the lower ne, the meiofauna was extremely impoverished, nsisting of very low numbers of nematodes. The e of meiofauna as bioindicators was discussed d supported. (Klein)
76-01945

REMARKS ON INDICATOR ORGANISMS (MEIOFAUNA) IN THE COASTAL WATERS OF THE GDR,
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
G. Arlt.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 272-279, 1975. 3 fig, 11 fig.

Descriptors: *Bioindicators, *Sediments, *Sampling, Sewage water, Water quality, Benthos, Biomass, Water pollution sources, Speciation.
Identifiers: *Coastal waters, *Meiofauna, Paranais litoralis, Nitocra spinipes, Amphichaeta sannio, Tachidius discipes, *Baltic Sea.

The influence of sewage on the qualitative and quantitative composition of the meiofauna was investigated on the basis of a number of unscreened live sediment samples taken from three stations in the eulittoral of the Greifswalder Bodden. Although all three localities were largely similar with respect to sediment quality, vegetation, degree of exposure, depth of water and salinity, there were noticeably differences between the sampling areas polluted by sewage and those which were free of pollution. An increase in the abundance of Paranais litoralis and Nitocra spinipes and a decrease in the numbers of Amphichaeta sannio and Tachidius discipes were noticed as the pollution increased. The practical value of indicator organisms for the classification of the waters in shallow inlets and their degree of pollution was briefly discussed with reference to the effort required to measure physical and chemical parameters. (Klein)
W76-01946

EFFECTS OF A SULPHATE PULP MILL ON THE BENTHIC MACROFAUNA IN A FIRTH OF THE BOTHNIAN SEA,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5C.
W76-01947

ALGAL ZONATION ON ROCKY SHORES OUTSIDE HELSINKI AS A BASIS FOR POLLUTION MONITORING,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
For primary bibliographic entry see Field 5C.
W76-01951

5C. Effects Of Pollution

STUDIES ON THE TOLERANCE OF YOUNG OF THE YEAR MISSISSIPPI RIVER FISH TO HEATED WATERS,
Wisconsin Univ.--Eau Claire. Dept. of Botany.
V. A. Cvancara.
Available from the National Technical Information Service, Springfield, Va 22161, as PB247-094, $3.50 in paper copy, $2.25 in microfiche. Completion Report, (1975). 21 p, 10 fig, 3 tab, 43 ref. OWRT C-4251 (No 9037) (1).

Descriptors: Freshwater fish, Aquatic animals, Aquatic life, *Juvenile fish, *Thermal pollution, Temperature, *Thermal stress, Bass, Bullheads, Carpsuckers, Drums, Pikes, White bass, Shad, Sunfish, Heated water, Water pollution effects, *Mississippi River, *Water temperature, *Minnesota.

An attempt was made to simulate in the laboratory, Mississippi River water conditions in a one way flow experimental chamber to determine the temperature tolerance of young-of-the-year fish. This parameter was chosen to simulate the environmental conditions that young fish would face in their natural hatching areas when confronted with an actual thermal plume as from the effluent of a large nuclear electricity generating plant. Young-of-the-year of eight Mississippi River species were obtained in sufficient numbers from the study area located near Winona, Minnesota. The temperature at which 50% of the experimental young-of-the-year fish survived the 48 hour test period were as follows: Gizzard shad (Dorosoma cepedianium) 28.5C; Bluegill (Lepomis macrochirus) 28.5C; Northern pike (Esox lucius) 30.8C; Freshwater drum (Aplodinotus grunniens) 32.8C; White Bass (Morone chrysops) 33.5C; Largemouth bass (Micropterus salmoids) 35.6C; Black bullhead (Ictalurus melas) 35.7C. The range of Mississippi River water temperature during July and August of 1973 was 23 to 31 C while the range during July and August 1974 was 22 to 33C. It appears that these young fish during short periods of peak summer temperatures would suffer some heat stress normally and the problem would be compounded if heated effluents were added to the river during periods of high summer temperature.
W76-01520

CHLORINATED SEWAGE EFFLUENTS AND AVOIDANCE REACTION OF STREAM FISH,
Maryland Univ., College Park. Inland Environmental Lab.
C. F. Tsai, and J. A. Fava, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 102, $4.50 in paper copy, $2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No 35, (July 1975). 59 p, 5 fig, 12 tab, 31 ref. OWRT A-022-MD(2) 14-31-0001-5020.

Descriptors: Sewage effluents, *Chlorine, *Ammonia, Toxicity, Water pollution effects, Lethal limit, *Fish behavior.
Identifiers: *Blacknose dace, *Chloramines, Avoidance index, Activity index, Threshold avoidance concentration, Median avoidance concentration, Latent period, Median avoidance time, Free chlorine.

The behavioral responsed of the blacknose dace to domestic sewage effluents and their toxic constituents, free chlorine, chloramine, and ammonia were investigated. The degrees of the fish avoidance to chlorinated sewage effluents were identical with those to the chloramine solutions and much higher than those to free chlorine solutions. The threshold avoidance concentration for chloramine solutions and chlorinated sewage effluents was 0.17 mg/l and 0.12 mg/l as total chlorine respectively, much lower than 0.58 mg/l for the free chlorine solutions. In a delayed response study, the fish could avoid both chloramine solution and free chlorine solutions as low as 0.07 mg/l. There was initial preference reactions to free chloride solutions, which shifted to avoidance reaction later. The latent period and the median avoidance time were shorter for chloramine solutions than for free chlorine solutions. The results indicate that chloramines are the major constituents of chlorinated sewage effluents, causin the absence or depletion of fish below sewage outfalls by the avoidance behavior of the fish.
W76-01523

TOXICITY OF ROTENONE TO SOME SPECIES OF COARSE FISH AND INVERTEBRATES,
Ministry of Agriculture, Nairobi (Kenya). Water Dept.
B. S. Meadows.
J Fish Biol. Vol 5, No 2, p 155-163, 1973. Illus.

Descriptors: *Rotenone, *Pesticide toxicity, Pesticide residues, Fish management.
Identifiers: Rutilus rutilus, Roaches.

The toxicity of rotenone was determined for 7 spp. of fish and 3 spp. of invertebrates. The results show that there is a marked variation in sensitivity of different species to rotenone. The survival

times of roach Rutilus rutilus (L.) were reduced by a rise in temperature and also by a reduction in water hardness. Temperature affected the rate at which rotenone is degraded; 3 days after being prepared a solution containing 2 mg/l of 5% rotenone was non-toxic to roach over a 7-day period at 20 degrees C, but it was still toxic for at least 11 days at 11.5C. The data are discussed in relation to the use of rotenone in fisheries management.--Copyright Biological Abstracts, Inc.
W76-01534

THE DYNAMICS OF NUTRIENT LIMITATION OF PHYTOPLANKTON ALGAE: A MODEL RECONSIDERED,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
For primary bibliographic entry see Field 2H.
W76-01540

AN INTRODUCTION TO THE PROCESSES, PROBLEMS, AND MANAGEMENT OF URBAN LAKES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2H.
W76-01588

THE MIGRATION OF FLY LARVAE (SIMULIIDAE) IN WATER WITH HIGH LEVELS OF TURBIDITY(IN RUSSIAN).
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
For primary bibliographic entry see Field 2I.
W76-01615

SOURCES AND DISTRIBUTION OF TRACE METALS IN AQUATIC ENVIRONMENTS,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5B.
W76-01651

SUMMERKILL RISK IN PRAIRIE PONDS AND POSSIBILITIES OF ITS PREDICTION,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1283-1288, 1975, 3 fig, 2 tab, 15 ref.

Descriptors: *Forecasting, *Fishkill, *Potholes, *Risks, Algae, Fish farming, Summer, Chlorophyll, Dissolved oxygen, Light penetration, Secchi disks, Ammonia, Nitrogen, Specific conductivity, Winter, Correlation analysis, Canada.
Identifiers: *Erickson-Elphinstone Area(Manitoba), Aphanizomenon flos-aquae, Microcystis.

Fifty-one pothole lakes in the Erickson-Elphinstone area of Manitoba were studied to obtain criteria for assessing and predicting summerkill risk. Collapses of heavy algal blooms, mostly Aphanizomenon flos-aquae, and subsequent oxygen depletion caused summer fish kills in these ponds. Kills only occurred in ponds where the specific conductance range was 800-2000 micromhos/cm and chlorophyll-a concentration above 100 micrograms/l. Prairie ponds with summer chlorophyll-a maxima of 25-100 micrograms/l developed only moderate blooms of Anabaena, Microcystis, or diatoms in the spring and never exhibited summerkill. Ponds with chlorophyll-a maxima below 25 micrograms/l were usually clear but frequently developed dense bottom vegetation. A practical system for assessing summerkill risk substituted Secchi disk transparency measurements for chlorophyll-a values. Correlations between various parameters indicated that the best correlation was between late winter ammonia nitrogen concentration and maximum chlorophyll-a concentration the following summer. Two summerkill prediction systems are proposed, based on ammonia, dissolved oxygen, and Secchi disk transparencies, enabling prediction of summerkill risk 3 or 9 months prior to fish stocking. The nine month system was more reliabe but more difficult because frequent sampling was necessary. Macrophyte chlorophyll-a concentrations and salinity effects on fish yields should also be considered. (Buchanan-Davidson--Wisconsin)
W76-01653

THE ROLE OF AMINO ACIDS IN THE NITROGEN CYCLE OF LAKE MENDOTA,
Wisconsin Univ., Madison. Water Chemistry Lab.
W. S. Gardner, and G. F. Lee.
Limnology and Oceanography, Vol 20, No 3, p 379-388, 1975, 5 fig, 3 tab, 24 ref. EPA 5 5-T02-WP-00184, EPA 16010.

Descriptors: *Amino acids, *Nitrogen cycle, *Eutrophication, *Wisconsin, Trace elements, Bacteria, Algae, Hypolimnion, Epilimnion.
Identifiers: *Dissolved free amino acids, *Lake Mendota(Wis), Aphanizomenon, Serine, Alanine.

To understand the importance of amino acids in the nitrogen cycle the concentration of dissolved free amino acids was determined in this eutrophic Wisconsin lake. Less than 0.01 micromoles dissolved free amino acids were present; they appeared to be controlled by bacterial uptake. Larger concentrations of combined amino acids were found. Of ten amino acids studied (alanine, valine, isoleucine, threonine, leucine, serine, proline, phenylalanine, tyrosine, and lysine, but not glycine), serine and alanine were most prevalent in the dissolved fraction. Free and combined amino acids showed little variation with season and depth, but the levels of particulate amino acids increased in the epilimnion during the warmer months, when conditions were favorable for algal growth. In the hypolimnion concentrations of amino acids in particulate material were lower than in the dissolved fraction. Daily examination of shore samples suggested that concentrations of dissolved free amino acids generally remained at trace levels, but higher concentrations were observed during a period of rapid algal decomposition after an Aphanizomenon bloom. Shore water samples taken daily 3 m below the lake surface contained lower and more uniform dissolved free amino acid concentrations than samples of surface water. (Buchanan-Davidson--Wisconsin)
W76-01654

COLLAPSES OF ALGAL BLOOMS IN PRAIRIE POTHOLE LAKES: THEIR MECHANISM AND ECOLOGICAL IMPACT,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, p 606-615, 1975, 11 fig, 1 tab, 19 ref.

Descriptors: *Eutrophication, *Algae, *Potholes, *Mode of action, Lakes, Fish farming, Cyanophyta, Chlorophyta, Canada, Summer, Diatoms, Spring, Oxygen sag, Phosphates, Ammonia, Nitrogen, Phosphorus, Toxins, Shallow water, Fishkill.
Identifiers: *Algal bloom mortality, *Erickson(Manitoba).

The consequences of algal bloom collapses were studied in prairie pothole lakes near Erickson, Manitoba, and especially their effect on fish farming. Massive algal die-offs in the eutrophic lakes consisted of collapses of Aphanizomenon flos-aquae blooms in July-early September of spring collapses of diatom blooms combined with small greens and non-Aphanizomenon blue-greens. Algal biomass reached its exponential phase rapidly with maximum chlorophyll-a and dissolved oxygen, and low Secchi transparency, ammonia, and soluble reactive phosphate, (SRP). Suddenly the algal mass sand, water cleared, dissolved oxygen dropped, and ammonia-nitrogen and SRP increased. After several partial collapses, a total crash occurred and anoxic conditions developed. Non-Aphanizomenon collapses released nitrogen, phosphorus, and ammonia-nitrogen. Ammonia and phosphate were released from lake sediments under anoxic conditions. The cause of algal collapses is not known. Ammonia-nitrogen in summer was inversely proportional to algal biomass; its release following algal collapse was accompanied by reactive phosphate release. Dissolved oxygen, a function of algal biomass, was directly proportional to chlorophyll-a. Primary production in an Aphanizomenon bloom was high. With even partial bloom collapse and dissolved oxygen depletion, respiration processes dominated the water column. After massive collapses, bacterial decomposition under anaerobic conditions can interfere with the entire ecosystem. (Buchanan-Davidson--Wisconsin)
W76-01655

NITROGEN, PHOSPHORUS AND CARBON CYCLES IN A DISTURBED EUTROPHIC ECOSYSTEM,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
FWI Reprint No. 373, 20 p, 8 fig, 1 tab, 8 ref. Paper presented at Second International Symposium on Environmental Biogeochemistry, April 8-11, 1975, Canada Centre for Inland Waters, Burlington, Ontario.

Descriptors: *Nitrogen cycle, *Phosphorus, *Carbon cycle, *Cycling nutrients, Carbon, Eutrophication, Algae, Biomass, Chlorophyll, Potholes, Oxygen sag, Diatoms, Ammonia, Phosphates, Dissolved oxygen, Nitrogen compounds, Organic compounds, Cyanophyta, Fish farming, *Canada.
Identifiers: *Erickson(Manitoba), Aphanizomenon flos-aquae, Microcystis, Merismopedia.

Seasonal cycles of nitrogen, phosphorus, and carbon were compared with those of dissolved oxygen and algal biomass (chlorophyll-a) in a eutrophic, prairie-pothole lake in the Erickson area of Manitoba. The lake became anoxic in midwinter due to ice and snow cover. Oxygen depletion of a shorter duration occurred following collapse of heavy summer blooms of Aphanizomenon flos-aquae or Microcystis, Merismopedia, and diatoms. Anoxic conditions caused rapid release of ammonia and reactive phosphate. Ammonia and reactive phosphate were inversely proportional to dissolved oxygen. Dissolved organic nitrogen, phosphorus, and carbon and inorganic carbon varied seasonally due to winter anaerobiosis. Particulate sestonic and dissolved organic nitrogen and phosphorus were major ammonia and reactive phosphate sources. Chlorophyll-a correlated with particulate carbon, nitrogen, and phosphorus. Lake nutrient cycles formed an internal system. Nutrients came from soil enriched with fertilizers and cattle farming, and were regenerated by winter decomposition of plankton and vegetation, creating conditions for blue-green algal blooms the next summer. These blooms governed the lake's oxygen regime. Bacterial oxygen depletion and accumulated algal material caused nutrient cycle disturbances. The nutrient regime determined the algal population; algal decomposition affected the nutrient regime. These phenomena affected water quality and lake suitability for fish survival. (Buchanan-Davidson--Wisconsin)
W76-01656

PERSISTENCE OF ENDOTHALL IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5B.
W76-01658

EFFECTS OF REGIONAL DEVELOPT ON THE ILLINOIS RIVER ENVIRONT,
homa State Univ., Stillwater. School of Civil neering.
primary bibliographic entry see Field 5B.
-01690

SIBLE IMPACTS OF OIL SHALE ELOPMENT ON LAND RESOURCES,
rado State Univ., Fort Collins. Dept. of nomics.
. Weaver.
nal of Soil and Water Conservation, Vol 29, 2, p 73-76, March-April, 1974. 2 fig, 2 tab, 14

criptors: *Oil shales, *Water resources, *Land ources, *Groundwater resources, *Water quali- *Water requirements, Fossil fuels, Oil wastes, pollution, Natural resources, Surface waters, ter conservation, Water management(Applied), ter pollution, Colorado River, Water supply, ter utilization, Arid lands, Colorado River in, Environmental effects, Overdraft, Groundter mining, Water wells, Salinity, Leaching.
ntifiers: *Oil shale development, Upper lorado River Basin, Shale waste.

e shale lands of principal interest lie within the rsely settled, more arid portions of the Upper lorado River Basin which provide forage for estock, wildlife habitat, natural areas for recreaon, and ground cover for the protection of tershed resources. Unacceptable environmental pacts that may result from the land distrubances ised by mining the oil shale, disposal of the reted spent shale waste, or in situ retorting and ll recovery of the shale oil are examined. oundwater systems would be especially sensie to overdraft or disruption of intake areas cause of the low rates of natural recharge tensive well pumpage in the northern Piceance reek Basin, which contains 2 of the proposed ase tracts, would cause water levels to decline veral hundred feet in less than one year). Emacement of spent shale in the surface environent could result in leaching, vadose percolation, rculating groundwaters, or slurry drainage which ould remove large amounts of sodium, calcium, agnesium, and sulfate ions. Salinity levels in reams could increase and an increase in the linity pollution in the Colorado main stem would e felt by water users in the lower basin states and lexico. (Robinett-Arizona)
/76-01691

NTERIC VIRUS BEHAVIOR IN SAND DUNES,
echnion Israel Inst. of Tech., Haifa. Environental Engineering Lab.
or primary bibliographic entry see Field 5D.
V76-01755

THE EFFECT OF OZONE ON THE DISSOLVED ORGANIC SUBSTANCES IN THE WATER OF LAKE CONSTANCE (WIRKUNG VON OZON AUF DIE GELOESTEN ORGANISCHEN SUBSTANZEN IM BODENSEEWASSER),
D. Maier.
Vom Wasser, Vol 43, p 127-160, 1974. 10 fig, 6 tab, 58 ref.

Descriptors: *Organic matter, *Ozone, *Water treatment, *Waste water treatment, Flocculation, Pollutant identification, Lakes.
Identifiers: Constance Lake.

A determination of the characterization of organic substances in the water of Constance Lake before and after ozone treatment was presented. The effects of ozone were measured by summarized parameters of total organic carbon, chemical oxygen demand and ultraviolet spectra. Total acid determination was also made for the ozonized water of the lake. Further detail was given by IR-spectroscopic investigations. The influence of ozone treatment on successive steps of treatment was further studied in terms of adsorption with activated carbon, flocculation, chlorine demand, and the growth of bacteria. (Kramer-FIRL)
W76-01760

SURVIVAL OF ENTEROBIRUSES ON VEGETABLES IRRIGATED WITH CHLORINATED OXIDATION POND EFFLUENTS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Food Engineering; and Technion Israel Inst. of Tech., Haifa. Dept. of Biotechnology.
H. Kott, and L. Fishelson.
Israel Journal of Technology, Vol 12, No 5/6, p 290-297, 1974. 5 fig, 3 tab, 19 ref.

Descriptors: *Chlorination, Solar radiation, *Viruses, *Irrigation, *Effluents, Waste water(Pollution), Pollutant identification, Oxidation lagoons, Ponds, Water pollution effects.
Identifiers: *Oxidation pond effluents, Phosphate buffered saline, Poliovirus 1 LSC.

Laboratory experiments were conducted on the irrigation of tomatoes and parsley by oxidation pond effluents. In the laboratory, tomatoes and parsley were dipped in chlorinated and non-chlorinated oxidation pond effluents (OPE) and in Phosphate Buffered Saline (PBS) containing attenuated poliovirus 1 LSC. The samples were then exposed to changing climactic conditions and virus counts were taken at set intervals. Solar radiation had a significant effect on the viruses. A minimum of 0.35 cal/sq cm min was needed to effect the rate of inactivation of the virus on the vegetable surface. Exposure to sunlight and to chlorination has a large effect on the amount of virus found on the vegetables, and the combined effect was even greater. Vegetables contaminated by virus in PBS solution were also affected greatly by solar radiation. Samples kept in the dark as a test still showed virus present after 6 days, whereas no active virus were found on the vegetables after being outside and exposed to two radiation peaks in 28 h. (Pinto-FIRL)
W76-01767

CONTAMINANTS IN RAINWATER AND THEIR RELATION TO WATER QUALITY, PART I,
Suffolk County Dept. of Environmental Control, N.Y.
For primary bibliographic entry see Field 5B.
W76-01769

PARTICIPATION OF MICROORGANISMS IN SULFUR TURNOVER IN POMIARETZKOE LAKE, (IN RUSSIAN),
Akademiya Nauk SSSS, Moscow. Institut Mikrobiologii.
V. M. Gorlenko, E. N. Chebotarev, and V. I. Kachalkin.
Mikrobiologiya. 43(5): 908-914. Illus. 1974.

Descriptors: *Lakes, *Microorganisms, *Sulfur bacteria, Sulfur, Meromixis, *Turnovers, Plankton, Entrophication.
Identifiers: Chlorobium-Vibrioforme, *Pomiaretzkoe Lakes, Thionic bacteria, USSR, Phototrophic bacteria.

The role of microorganisms in production and oxidation of S was studied in the meromictic lake Pomiaretzkoe (USSR) occupying the place of a former ozokerite mine. Water in the surface layers of the lake is fresh, while deep water contains up to 10 g/l of chlorides, 4.1 g/l of C02 and 340 mg/l of H2S. The highest rate of H2S production (30 mg/l/day) was registered in the upper layer of ozone deposits. The rate of H2S reduction in water was lower, but still almost 10 times higher than in water of other lakes of similar type. A high rate of sulfate reduction was due to a sufficient content in water and in oozes of sulfates, organic substances, phyto- and bacterioplankton, and organic substances of ozokerite origin. H2S in the lake was oxidized by the phototrophic sulfur bacterium Chlorobium vibrioforme, the plankton variant, and to a lesser extent, the thionic bacteria. A layer of green water, containing up to 46.106 cells of C. vibrioforme in 1 ml of water, was found at the depth of 3.0-3.5m. The maximal production of the phototrophic bacteria in this zone was 90 micro C/l/day.--Copyright 1975, Biological Abstracts, Inc.
W76-01774

ORGANICS, WATER, AND HEALTH: A REUSE PROBLEM,
California State Dept. of Health, Los Angeles. Water Sanitation Section.
For primary bibliographic entry see Field 5D.
W76-01789

THE ROLE OF PLANT RESIDUES IN THE RETENTION OF CADMIUM IN ECOSYSTEMS,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W76-01813

SOME EFFECTS OF CADMIUM ON CONIFEROUS FOREST SOIL/LITTER MICROCOSMS,
National Ecological Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B.
W76-01862

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON MANGANESE,
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-01863

THE EFFECT OF MIREX AND CARBOFURAN ON ESTUARINE MICROORGANISMS,
Mississippi State Univ., Mississippi State. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-01864

ANALYSIS OF HYDROCARBONS IN MARINE ORGANISMS: RESULTS OF IDOE INTERCALIBRATION EXERCISES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-01901

SOME FACTORS INFLUENCING BYSSUS THREAD PRODUCTION IN MYTILUS EDULIS (MOLLUSCA: BIVALVES) LINNAEUS, 1758,
University of Southern California, Los Angeles. Allan Hancock Foundation.
T. Martella.
Water, Air and Soil Pollution, Vol 3, p 171-177, 1974. 2 fig, 1 tab, 7 ref.

Descriptors: *Biorhythms, *Mussels, *Animal physiology, Populations, Productivity, Growth rates, Tidal effects.
Identifiers: *Byssal thread production, Mytilus edulis, Circadian rhythms, Proximity.

Byssus thread production factors in Mytilus edulis considered were proximity to other M. edulis, circadian rhythms, and tidal rhythms. Production was greater at night than during the day, and greater for mussels clumped together. Tidal fluctuations had no influence on byssal thread production. The use of the average number of byssus threads produced/animal/hour as a measure of sublethal effects of pollutants may be subject to error. (Klein)
W76-01903

EFFECTS OF LEAD AND HYDROCARBONS FROM SNOWMOBILE EXHAUST ON BROOK TROUT (SALVELINUS FONTINALIS),
New Hampshire Univ., Durham. Dept. of Zoology.
E. S. Adams.
Transactions of the American Fisheries Society, No 2, 1975. 7 fig, 5 tab, 39 ref.

Descriptors: *Salmonids, *Brook trout, *Oil, *Organic compounds, *Lead, Ponds, Snowmelt, Path of pollutants, Water pollution effects, Environmental effects, Water quality.
Identifiers: Snowmobiles, *Snowmobile exhaust, Fingerlings, Tissue analysis, Bioaccumulation.

Lead content of the water in a Maine pond rose from 4.1ppb before snowmobiling to 135 ppb at ice-out; exposed brook trout (Salvelinus fontinalis) fingerlings contained 9 to 16 times more lead than controls. Hydrocarbon levels undetectable prior to snowmobiling reached 10ppm in the water and 1 ppm in exposed fish. Trout held in aquaria for 3 weeks in melted snow containing three different concentrations of snowmobile exhaust also showed lead and hydrocarbon uptake. Their digestive tract tissue contained the most lead (2ppm) and gills the least (0.2ppm). Stamina, as measured by the ability to swim against current, was significantly less in trout exposed to snowmobile exhaust than in control fish. (Klein)
W76-01904

CHRONIC EFFECTS OF COPPER ON SURVIVAL, GROWTH, AND REPRODUCTION OF THE BLUEGILL (LEPOMIS MACROCHIRUS),
National Water Quality Lab., Duluth, Minn.
D. A. Benoit.
Transactions of the American Fisheries Society, No 2, p 353-358, 1975. 4 tab, 19 ref.

Descriptors: *Copper, *Sunfishes, Survival, Growth rates, Path of pollutants, *Toxicity, Water quality, Fish physiology, Fish reproduction, Water pollution effects, Lethal limit.
Identifiers: *Bluegills, Lepomis macrochirus, Bioaccumulation, Tissue analysis.

During a 22-month exposure of bluegills (Lepomis macrochirus) to copper in soft water, adult bluegill survival was reduced, growth was retarded, and spawning was inhibited. Significant quantities of copper had accumulated in the gills and liver. The maximum acceptable toxicant concentration was between 21 and 40 micrograms Cu/liter. (Klein)
W76-01906

RESISTANCE OF A NORTHWESTERN CRAYFISH, PACIFASTACUS LENIUSCULUS (DANA) TO ELEVATED TEMPERATURES,
Batelle Pacific Northwest Lab., Richland, Wash.
C. D. Becker, R. G. Genoway, and J. A. Merrill.
Transactions of the American Fisheries Society, No 2, p 374-387, 1975. 6 fig, 5 tab, 29 ref.

Descriptors: *Invertebrates, *Crayfish, *Temperature, *Heat resistance, Growth stages, Water quality, Salmonids, Thermal pollution, Water pollution effects.
Identifiers: Pacifastacus leniusculus, Egg bearing females, Sex difference.

The upper lethal temperature for crayfish, Pacifastacus leniusculus, was near 32-33 degrees C. Moulting individuals, pre-breeding mature females, and larger crayfish were less resistant to high temperature stress than egg-bearing females, small crayfish, and males. P. leniusculus were more tolerant of elevated temperatures than native salmonids, but less tolerant than some introduced 'warmwater' fish. (Klein)
W76-01907

A SIMPLE DOSING SYSTEM FOR CONTINUOUS STREAM DOSING,
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
For primary bibliographic entry see Field 7B.
W76-01908

RELATIONSHIPS BETWEEN SEDIMENT OIL CONCENTRATIONS AND THE MACROINVERTEBRATES PRESENT IN A SMALL STREAM FOLLOWING AN OIL SPILL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies
R. C. Hoehn, J. R. Stauffer, M. T. Masnik, and C. H. Hocutt.
Environmental Letters, Vol 7, No 4, p 345-352, 1974.

Descriptors: *Oil spills, Streams, *Oil pollution, *Biological communities, *Sediments, Aquatic animals, *Benthos, Environmental effects, Water pollution sources, Water pollution effects, Toxicants, Toxicity, Virginia.
Identifiers: Species diversification, *Sediment oil analysis.

A study was conducted to assess the effects of an oil spill on the macroinvertebrate populations in a small creek in Virginia. Sediments were extracted with hexane, and the residue concentrations were correlated with the numbers and diversities of macroinvertebrates collected downstream of the spill. Based on the available data, it was concluded that the effect of the oil spill was a toxic one rather than one of rendering the sediments unsuitable for colonization. (Katz)
W76-01910

CHEMICAL ANALYSIS OF TRACE ELEMENTS IN ICELAND GEYSIRS WITH REMARKS ON MASTIGOCLADUS LAMINOSUS COHN,
Copenhagen Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W76-01912

STATUS OF UPTAKE OF MERCURY BY THE FRESH WATER DIATOM, SYNEDRA ULNA,
Institute of Public Health, Tokyo (Japan).
M. Fujita, and K. Hashizume.
Water Research, Vol 9, No 10, p 889-894, October 1975. 6 fig, 4 tab, 10 ref.

Descriptors: *Diatoms, *Heavy metals, *Mercury, Aquatic microorganisms, Microbiology, Path of pollutants, Metabolism, Plant physiology, Phytoplankton, Plankton, Food chains.
Identifiers: *Synedra ulna, Bioaccumulation, Tissue analysis.

Synedra, a fresh water diatom, took up mercuric chloride rapidly from the surrounding water into the cells attaining the maximum level during the first 7h. The comparison of mercury uptake by dividing cells was that of non-dividing, heat killed cells and their silicate shells showed that some factors other than cell-division or photosynthesis were responsible for mercury uptake by Synedra cells. About 20% of the total amount of mercury found in dividing cells was taken up by passive adsorption and could be eliminated by washing with distilled water or medium. About 50% of the mercury could not be eluted even with cysteine solution and was accumulated in the inner part of cells. Syndera took up 0.45 micro-m filterable or ionic mercury rather than particulate mercury larger than 0.45 micro-m. (Klein)
W76-01913

COMPARATIVE DISCHARGES OF FRESH AND WASTE WATER ALONG THE CALIFORNIA COAST,
California Univ., Santa Cruz. Earth Sciences Board.
For primary bibliographic entry see Field 5B.
W76-01914

TRACER EXPERIMENTS ON THE EFFECT OF MICRONUTRIENTS ON THE GROWTH OF PORPHYRA PLANTS-II MANGANESE-54 AND ZINC-65 ASSIMILATION IN RELATION TO ENVIRONMENTAL FACTORS,
Nansei Regional Fisheries Research Lab., Maruishi (Japan)
J. Tsukidate
Bulletin of the Nansei Regional Fisheries Laboratory, No 7, p 9-18, August 1974. 10 fig, 2 ref.

Descriptors: *Tracers, *Nutrients, *Aquatic plants, Manganese, Zinc, *Radioisotopes, *Growth rates, Laboratory tests, Analytical techniques, Environmental effects, Water pollution effects.
Identifiers: *Bioaccumulation, *Porphyra, *Manganese-54, *Zinc-65.

The amounts of manganese-54 and zinc-65 assimilated by Porphyra plants under various environmental conditions were investigated. The rates of assimilation were primarily dependent on the concentrations of the isotopes themselves. The manganese-54 assimilation was also affected by pH. Its maximum assimilation in artificial sea water at 9-10 degrees C, pH 8.2 and 3,000 lux, was 0.00135 microgram per 50.24 sq mm thallus piece. The maximum amount of zinc-65 assimilation in artificial sea water at 9-10 degrees C, pH 9, and 3,000 lux, was 0.0043 microgram per 50.24 sq mm thallus piece. (Klein)
W76-01916

STUDIES ON THE ANESTHETIC EFFECTS OF EUGENOL TO KURUMA PRAWN JUVENILES (IN JAPANESE),
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
H. Ishioka, O. Fukuhara, and S. Sakaguchi.
Bulletin of the Nansei Regional Fisheries Research Laboratory, No 7, p 31-42, August 1974. 7 fig, 5 tab, 7 ref.

Descriptors: *Crustaceans, *Animal physiology, *Organic compounds, Survival, Growth rates, Laboratory tests, Water pollution effects.
Identifiers: *Kuruma prawns, Penaeus japonicus, *Anesthesia, *Eugenol, Bioaccumulation.

Kuruma prawn (Penaeus japonicus) juveniles were found to be anesthetized between 50-200 ppm concentrations of Eugenol. Higher concentrations and water temperature shortened anesthetizing time. Most prawns recovered from the anesthesia within one hour except at low water temperatures. Starvation, molting and low chlorinity of the medium affected the anesthetizing time. Physiological conditions increasing water content of the prawns seemed to shorten the anesthetizing time. The Eugenol treatment appeared to have no serious affect on the growth and survival of the juvenile prawns. (Klein)
W76-01917

A RESPIROMETER TECHNIQUE FOR EVALUATING THE POTENTIAL EFFECTS OF RAPID THERMAL CHANGES TO SMALL AQUATIC ORGANISMS,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
L. B. Richardson, D. T. Burton, and S. L. Margrey.
The Progressive Fish-Culturist, Vol 37, No 1, p 57-58, January 1975. 2 fig, 2 ref.

Descriptors: *Methodology, Technology, *Respiration, Temperature, Oxygen requirements, Aquatic animals, Laboratory tests, Water pollution effects, *Thermal pollution, Pollutant identification.
Identifiers: *Respirometers.

A system was designed for thermal entrainment studies. A modified respirometer was used for determining pre-stress oxygen consumption, and

uent post-stress O2 levels to evaluate al physiology adjustments of small aquatic ms at various temperatures. (Klein) 920

SLOCATION OF HYDROCARBONS IN TIC FOOD CHAINS,
nia Univ., Davis. Dept. of Animal Physiolo-

Brocksen, and A. W. Knight.
mmary Report 1974, Food Protection and logy Center, University of California, p 15-19, 2 fig.

ptors: *Shrimp, *Organic compounds, iration, *Toxicity, Environmental effects, chains, *Lethal limit, *Bioassay, Laborato-s, Feeding rates, Behavior, Water pollution s, Pollutants, Toxicants, Shellfish, Califor-

fiers: Crago franciscorum, Crago migrican-*Kelthane, *Sublethal effects, San Pablo alif).

ffect of kelthane, a chlorinated hydrocarbon, growth, respiration, accumulation, feeding, g and behavior of the San Pablo Bay shrimp, franciscorum and C. nigricandata were in-ated. This shrimp is a primary food source demic and migrating fishes. The 96-hr LC50 ne for Crago at 19 degrees C and 19% salini-s 200 ppb. The lethal threshold was close to pb kelthane. The chronic bioassay 192-hr at 16C and 19% salinity was 34ppb and the threshold was 14-33ppb. Kelthane appeared press respiration, and feeding and altered al behavior patterns. (Katz) 01921

HOGENICITY STUDIES WITH A EPTOCOCCUS SP. ISOLATED FROM IES IN AN ALABAMA-FLORIDA FISH L,
Coast Research Lab., Ocean Springs, Miss. obiology Section.
. Cook, and S. R. Lofton.
sactions of the American Fisheries Society, , p 286-288, 1975. 2 tab, 1 ref.

criptors: *Fish diseases, *Fishkill, eptococcus, *Bacteria, Water quality, robiology, Water pollution effects, Pathology, hogenic bacteria.
tifiers: *Pathogenicity studies, Atlantic ker, Sea catfish, Gulf menhaden, Striped mul- Spot, Micropogon undulatus, Arius felis, voortia patronus, Mugil cephalus, Leistomus thurus.

Streptococcus sp. isolated from moribund fish 1972 Alabama-Florida fish kill produced mor-ies in five species of fish involved in the kill. hogenicity studies with six non-fish-related ptococci were also conducted on two of the es. (Klein)
6-01922

IMULATION AND INHIBITION OF YTOPLANKTON GROWTH BY LOW OLECULAR WEIGHT HYDROCARBONS,
idaway Inst. of Oceanography, Savannah, Ga.
M. Dunstan, L. P. Atkinson, and J. Natoli.
arine Biology, Vol 31, No 4, p 305-310, 1975. 2 , 1 tab, 20 ref.

escriptors: *Organic compounds, hytoplankton, *Growth rates, *Oil wastes, ater pollution sources, Analytical techniques, ater pollution effects.
entifiers: *Bioaccumulation, *Benzene, oluene, Xylene, Amphidinium carterae, Du-liella tertiolecta, Skeletonema costatum, icosphaera carterae.

Experiments on 4 different phytoplankton exposed to a range of concentrations in culture of benzene, toluene and xylene showed a variety of growth responses for marine microalgae. Stimulation of growth in Dunaliella tertiolecta resulted from low microgram per liter concentrations of all three compounds, Skeletonema costatum showed no growth enhancement, while Cricosphaera carterae and Amphidinium carterae were intermediate in their reactions. The species-specific stimulation of low concentrations was further shown in experiments with mixtures of No 2, fuel oil. The volatile fraction was most biologically reactive, being the source of growth enhancement at low levels and a major growth inhibitor at high concentrations. (Klein)
W76-01923

FACTORS AFFECTING THE ACCUMULATION AND REMOVAL OF MERCURY FROM TISSUES OF THE AMERICAN OYSTER CRASSOSTREA VIRGINICA,
Delaware Univ., Newark. Dept. of Biological Sciences.
P. A. Cunningham, and M. R. Tripp.
Marine Biology, Vol 31, No 4, p 311-319, 1975. 3 fig, 5 tab, 29 ref.

Descriptors: *Oysters, *Heavy metals, *Mercury, Path of pollutants, Animal physiology, Analytical techniques, Water pollution sources, Temperature, Water pollution effects.
Identifiers: *America oysters, *Bioaccumulation, *Tissue analysis.

Adult oysters, Crassostrea virginica, were held in seawater containing 10 to 100 parts per billion mercury. After 45 days mercury tissue concentration was 91,600 and 12,100 ppb in the 100 and 10 ppb mercury groups, respectively. The biological half-life of mercuric acetate was 16.8 and 9.3 days in a 25 degree temperature regime, and 35.4 and 19.9 days in a declining (25 to 5 degrees) temperature regime. Smaller oysters (0-7 grams) consistently accumulated more mercury per gram wet weight than larger oysters. (Klein)
W76-01924

TOTAL MERCURY IN SOME FISH AND SHELLFISH ALONG THE MEXICAN COAST,
Pennsylvania State Univ., University Park.
A. A. Reimer, and R. D. Reimer.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 1, p 105-111, July 1975. 4 tab, 15 ref.

Descriptors: *Heavy metals, *Toxicity, Path of pollutants, *Shrimp, *Mollusks, *Fish, *Mercury, Water quality, Environmental effects, Fish physiology, Mullets, *Mexico, Water pollution effects.
Identifiers: *Bioaccumulation, Grey mullet, Mugil cephalus, Anisotremus interruptus, Diapterus, Codakia orbicularis, Tissue analysis, Penaeus, Muscle, Liver, Andara, Crassostrea virginica.

The mercury content found in muscle and liver of three species of fish-grey mullet Mugil cephalus, Anisotremus interruptus, and Diapterus from several Mexican localities ranged from 0.01-0.38 micrograms/gram in the muscle and 0.01-0.47 micrograms/gram in the liver. In all species investigated the mercury content of the liver was higher, sometimes more than double, that of the muscle. Value of mercury is shrimp (Penaeus) ranged from 0.01-0.67 micrograms/gram. Mercury contents in mollusks were low, except in the tiger lucine, Codakia orbicularis. (Klein)
W76-01925

INFLUENCE OF NAC1, CA2+, AND MG2+ ON THE GROWTH OF A MARINE BDELLOVIBRIO SP.,
Otago Univ. Dunedin (New Zealand). Dept. of Microbiology.
R. G. Bell, and D. J. Latham.
Estuarine and Coastal Marine Science, Vol 3, No 3, p 381-384, July 1975. 1 tab, 7 ref.

Descriptors: *Sewage, *Ions, *Salts, *Bacteria, Microorganisms, Sewage bacteria, Sodium chloride, Magnesium, Calcium cultures, E. Coli, Growth rates, Speciation, Water pollution effects.
Identifiers: *Marine bdellovibrio, Bacteriology.

A marine bdellovibrio was isolated from sewage-polluted coastal water, with Escherichia coli K12 as host organism, using a polyethylene bag humidor incubation technique. The isolate was able to grow only on sea water or 1.5%-5% NaCl-based yeast-peptone medium. Growth of the isolate was strongly stimulated by the addition of 0.002 M-Ca2+/and 0.002 M-Mg2+/to the NaCl-based medium. It was concluded that the isolate was halophilic and thus should be considered as distinct from, but related to, terrestrial strains. (Klein)
W76-01926

STUDIES ON THE EFFECTS OF TEMPERATURE ON EGG LAYING OF THREE SPECIES OF CALANOID COPEPODS IN THE LABORATORY (ACARTIA TONSA, TEMORA LONGICORNIS, PSEUDOCALANUS ELONGATUS),
Dalhousi Univ., Halifax (Nova Scotia). Dept. of Biology.
C. J. Corkett, and E. J. Zillioux.
Bulletin of the Plankton Society of Japan, Vol 21, No 2, p 77-85, April 1975. 1 fig, 2 tab, 22 ref.

Descriptors: *Copepods, *Temperature, Growth stages, Life cycles, Fertility, Populations, Growth rates, Fecundity, *Thermal pollution, Water pollution effects.
Identifiers: *Acartia tonsa, *Temora longicornis, *Pseudocalanus elongatus, Egg production.

A study of egg production in artificial sea salt over a range of temperature showed that the rate of egg production in the sac-carrying copepod Pseudocalanus elongatus was lower than that found in Acartia tonsa and Temora longicornis, which lay single eggs. It was suggested that carrying eggs attached to the females in sacs may limit the maximum egg production rate (maximum fecundity) since a new sac cannot be laid until the old one hatches. (Klein)
W76-01927

DRASTIC REDUCTION OF THE WHITE PERCH, MORONE AMERICANA, POPULATION IN THE JAMES RIVER, VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
R. A. St. Pierre, and W. J. Hoagman.
Chesapeake Science, Vol 16, No 3, p 192-197, September 1975, 2 fig, 3 tab, 15 ref.

Descriptors: *White perch, *Populations, *Fishkill, Trawling, Commercial fishing, Water quality, *Virginia, Water pollution effects.
Identifiers: *James River(Va).

The white perch population in the James River declined to near extinction by the summer of 1971. Only several individuals were captured after extensive trawling and beach seining in 1972 and 1973, whereas similar effort yielded thousands in previous years. The commercial catch simultaneously dropped to an all-time low. The cause of the population plummet apparently was a massive fish kill in May of 1971. The precise cause of the fish kill was not determined. (Klein)
W76-01928

MARINE MEIOFAUNA OF A NEW YORK CITY BEACH WITH PARTICULAR REFERENCE TO TARDIGRADA,
City Coll., New York. Dept. of Biology.
E. A. Martinez.
Estuarine and Coastal Marine Science, Vol 3, No 3, p 337-248, July 1975. 5 fig, 3 tab, 56 ref.

Descriptors: Beaches, *Microorganisms, *Nematodes, Sediments, Sampling, Water quality, Effluents, Sewage, Population, New York.
Identifiers: *Marine Meiofauna, *Tardigrades, Batillipes mirus, Batillipes pennaki, *New York Ctiy beaches.

Distribution and abundance of meiofauna of a New York City beach were studied. Environmental variables included particle size distribution, temperature, salinity, and interstitial water content. The substratum consisted of quartz. Both temperature and salinity were greatly influenced by adjacent offshore sea water. Nematodes were the dominant taxon, averaging 85.5% of the total collection. Tardigrades represented 6%, including Batillipes mirus and B. pennaki. (Klein)
W76-01930

HYDROGEN PEROXIDE AS A SOURCE OF OXYGEN SUPPLY IN THE TRANSPORT OF FISH FRY,
Institute of Science, Nagpur (India). Dept. of Zoology.
For primary bibliographic entry see Field 5G.
W76-01931

A POSSIBLE REACTION OF ATLANTIC SALMON (SALMO SALAR) TO INJECTED CHLORAMPHENICOL,
Michigan Dept. of Natural Resources, Lansing. Fisheries Div.
V. E. Bennett.
The Progressive Fish-Culturist, Vol 37, No 2, p 114, April 1975.

Descriptors: *Salmonids, *Atlantic salmon, *Fish physiology, *Organic compounds, Spawning, Bacteria, Toxicity, Fish diseases, Michigan, Water pollution effects.
Identifiers: *Chloramphenicol, Bioaccumulation, Boyne River(Mich).

Atlantic salmon (Salmo salar) returning to Michigan's Boyne River appeared to be undergoing physiological stress. Transfer of fish to a more suitable environment was initiated. The injection of transferred fish with chloramphenicol was attempted to reduce the mortality due to bacterial infections. Mortalities occurred and fish were peppered with reddish-colored nodules resembling allergic hives. (Klein)
W76-01932

AN ULTRAVIOLET SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF NAPHTHALENE AND ALKYLNAPHTHALENES IN THE TISSUES OF OIL CONTAMINATED MARINE ANIMALS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-01933

STUDIES ON DEATH OF FISH CAUSED BY RED TIDE, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
T. Matsusato, and H. Kobayashi.
Bulletin of the Nansei Regional Fisheries Research Laboratory, No 7, p 43-68, August 1974; 22 fig, 2 tab, 30 ref.

Descriptors: Fish, *Fish physiology, *Respiration, *Red tide, *Plankton, *Fish toxins, Oxygen requirements, Fish behavior, Mortality, Water pollution effects, Fishkill.
Identifiers: Red Sea Bream, Chrysophrys major, Yellow trail, Asphyxiation, Seriola quinqueradiata, Hemieutreptia antiqua.

The influences of the red tide on the red sea bream, Chrysophrys major, and the cultured yellow tail, Seriola quinqueradiata, were investigated in their use of the marine plankton, Hemieutreptia antiqua. Breathing rate, heart pulsation rate, and other physiological effects were investigated in both species. Oxygen levels and fish behavior were recorded. The cause of death of the fish attributed to the red tide was based on asphyxiation due to interception of the ventilation water in the branchia. (Klein)
W76-01934

EXCESS NITROGEN GAS IN WATER NOT A CAUSE OF COAGULATED YOLK DISEASE IN CHINOOK SALMON,
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
R. R. Rucker.
The Progressive Fish-Culturist, Vol 37, No 2, p 101-102, April 1975. 1 fig, 1 tab, 2 ref.

Descriptors: *Chinook salmon, *Salmonids, *Nitrogen, *Dissolved oxygen, Growth stages, Fish eggs, Fry, Fish physiology, Fish diseases, Toxicity, Water pollution effects.
Identifiers: Bioaccumulation.

No evidence of white spot or coagulated yolk disease from the exposure of excess nitrogen in water to chinook salmon (Oncorhynchus tshawytscha) eggs and fry was observed. Fingerlings showed peduncle deformities possibly resulting from oxygen deficiency during egg stage. (Klein)
W76-01935

EFFECTS OF AGRICULTURAL LIMESTONE ON WATER CHEMISTRY, PHYTOPLANKTON PRODUCTIVITY, AND FISH PRODUCTION IN SOFT WATER PONDS,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
R. G. Arce, and C. E. Boyd.
Transactions of the American Fisheries Society, No 2, p 308-312, 1975, 2 fig, 4 tab, 16 ref.

Descriptors: *Tilapia, *Primary productivity, *Limestone, Fish, Ponds, Water quality, Fertilizers, *Phytoplankton, Water pollution sources, Nitrates, Phosphates, Hydrogen ion concentration, Water chemistry, Hardness(Water), Food chains, Water pollution effects.
Identifiers: Tilapia aurea, Fish culture.

Five ponds treated with agricultural limestone and five control ponds were stocked with Tilapia aurea and fertilized every two weeks with ammonium nitrate and triple superphosphate. Initially, total hardness and total alkalinity of the waters in the 10 ponds averaged 7.8 and 13.7 mg/liter, respectively. Liming caused a fourfold increase in total hardness and total alkalinity. Limed ponds had higher rates of phytoplankton productivity and yielded a 25% greater weight of fish than control ponds. (Klein)
W76-01936

ZOOPLANKTON ENTRAINMENT AT THREE MID-ATLANTIC POWER PLANTS,
Henningson, Durham and Richardson Inc., Santa Barbara, Calif. Ecosciences Div.
R. M. Davies, and L. D. Jensen.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2130-2142, August 1975, 9 fig, 2 tab, 14 ref.

Descriptors: *Zooplankton, *Power plants, *Water quality, Survival, Water cooling, Temperature, Chlorine, Sampling, Thermal pollution, Water pollution effects.
Identifiers: *Entrained zooplankton, Thermal tolerance.

The change in mortality of zooplankton resulting from entrainment into cooling water systems depended on the interaction of ambient temperature, temperature rise, mechanical stress, and chlorine levels when applied. Analysis of zooplankton survival to quantity delayed mortality or impaired reproductive potential was found necessary to ascertain the fate of entrained plankton which might have been otherwise hidden by dilution in the mixing zone of the discharge canal. Population changes between the intake the discharge, and receiving water were studied for estimation of survival of entrained zooplankton. (Klein)
W76-01937

THE DYNAMICS OF METALS IN THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA SEASONAL EFFECTS,
Johns Hopkins Univ., Baltimore, Md. School Hygiene and Public Health.
J. M. Frazier.
Chesapeake Science, Vol 16, No 3, p 162-171, September 1975. 4 fig, 4 tab, 33 ref

Descriptors: *Oysters, *Mollusks, *Animal physiology, *Metals, Metabolism, Path of pollutants, Cadmium, Manganese, Zinc, Copper, Growth rates, Water pollution effects.
Identifiers: *American oysters.

Different patterns of metal dynamics were observed as a result of the reduction in biological variation realized by employing genetically similar American oysters, Crassostrea virginica. Mn and Fe concentrations in soft tissues were significantly correlated with shell deposition. A high rate of metal turnover in soft tissues occurred during the short growth season. Zn and Cu body burdens exhibited a gradual increase during the spring and summer followed by a rapid loss during August-September in which 33% of the Zn and 50% of the Cu was lost in 4 weeks. Cd behavior was similar to that of Mn and Zn. (Klein)
W76-01938

THE INFLUENCE OF EMBANKMENTS ON THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN THE ARCHIPELAGO OF FOGLO, ALAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
J. Westerberg.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, No 239, p 78-82, 1975. 2 fig, 4 ref

Descriptors: *Embankments, *Primary productivity, *Phytoplankton, *Channels, Environmental effects, Water quality, Benthic flora, Currents(Water).
Identifiers: *Finland(Archipelago of Foglo).

The primary production of phytoplankton was measured in situ by the 14C method at three localities with embankments. The stations were all situated in long channels, where water currents are more important ecological factor than wave action. The embankments create stagnant conditions, or considerably decrease the flow of water. At some of the stations the macrophytes formed a carpet on the bottom in shallow water, and phytoplanktonic primary production seemed to be inversely related to the density of the bottom vegetation. However, there were indications that the total production of aquatic plants increased in places where embankments influenced the flow of water. (Klein)
W76-01940

EUTROPHICATION AND MASS PRODUCTION OF BLUE-GREEN ALGAE IN THE BALTIC,
Kiel Univ., (West Germany). Institut für Meeresforschung.
U. Horstmann.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 83-90, 1975. 1 fig, 3 tab, 28 ref.

Descriptors: *Primary productivity, *Cyanophyta, *Water quality, Population, Food chains, Food webs, Life cycles, Algae, Water pollution effects.
Identifiers: Aphanizomenon flos-aquae, Nodularia spumigena, *Baltic Sea.

occurrences of the blue-green algae
izomenon flow-aquae and Nodularia
ngena have been observed more often in the
proper during the last few years. The
t paper touched on some questions con-
with the mass-production of
phyceae, such as the origin of the blue-
algae blooms, their limitation by nutrients,
itrogen fixation and their role as nitrate sup-
The agglomeration of blue-green algae was
to be a biotic community, and some rela-
of these algae in the food web were ex-
d. Some results of in situ experiments and
laboratory investigations were given.
n)
01941

CT ON DETERGENTS AND OF
SPHO-GYPSUM ON THE OXYGEN AND
OROPHYLL A LEVELS AND ON THE DRY
GHT OF THE RESIDUE OF BRACKISH
ER UNDER LABORATORY CONDITIONS,
cal Academy, Gdansk (Poland). Dept. of
gy.
ytniewski, G. Drewa, and F. Pautsch.
roceedings of the 3rd Baltic Symposium on
ne Science, Helsinki, No 239, p 100-104, 1975.
les, 15 ref.

riptors: *Water quality, *Detergents,
sphorus compounds, *Oxygen, *Chlorophyll,
er pollution sources, Laboratory tests,
kish water, Eutrophication.
tifiers: *Phospho-Gypsum, Chlorophyll A.

ng the first two weeks of the laboratory ex-
ment the oxygen and chlorophyll a levels of all
detergent and phospho-gypsum solutions were
er than in the control aquarium. Observations
cated that detergents in low concentrations
phospho-gypsum in 0.20% or weaker solutions
eloped a eutrophying effect after several
ks of incubation under laboratory conditions.
ein)
6-01942

OVE GROUND PRODUCTION AND CHEMI-
L ANALYSIS OF PHRAGMITES COMMUNIS
POLLUTED BRACKISH WATER,
ckholm Univ. (Sweden). Botany Inst.
-G. Wallentinus.
Proceedings of the 3rd Baltic Symposium on
rine Biology, Helsinki, No 239, p 109-115, 1975.
g, 1 tab, 7 ref.

scriptors: Technology, *Submerged plants,
trogen, Phosphorus, Biomass, Analytical
hniques, Chemical analysis, Water quality,
gnant water, Sodium, Potassium, Magnesium,
lcium, Brackish water.
entifiers: *Phragmites communis, *Reeds culms.

e two aims of this investigation were to develop
simple method for the determination of the
ove ground biomass of reed-beds and to in-
stigate the distribution of certain ions in the read
lm, Phragmites communis. The culms were har-
sted down to and including the upper parts of
e rhizomes. The culms were dried and the stems
ere cut into 10-cm sections and weighed. From
ese weights formulas were constructed, where
e total weight of the culm aove the water sur-
ce, the weight of the stem at the water surface,
nd the water depths were inputs, giving the
eight of the entire culm. Diving was thus neces-
ary only for collecting the material for estimating
e formula constants. The dried material was then
round, wet combusted and analyzed for N,P and
ertain cations. The maximum concentrations of N
nd P were found in the physiologically active
arts, whereas the cations showed a more
eterogeneous distribution. (Klein)
W76-01943

ON THE INFLUENCE OF SEWAGE POLLUTION ON INSHORE BENTHIC COMMUNITIES IN THE SOUTH OF KIEL BAY. PART I. QUALITATIVE STUDIES ON INDICATOR SPECIES AND COMMUNITIES,
Kiel Univ., (West Germany). Zoologisches Institut.
K. Anger.
In: Proceedings on the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 116-122, 1975. 6 fig, 1 tab, 10 ref.

Descriptors: *Bioindicators, *Biological communities, Marine animals, Bivalves, Amphipoda, Water pollution sources, Water quality, *Sewage, *Grasses, Sands, Bays, Water pollution effects.
Identifiers: *Polychaetes, Eelgrasses, Mytillus, Batyporeia sarsi, Nephthys caeca, Scoloplos armiger, Eteone longa, Cardium lamarcki, *Kiel Bay(Germany).

A qualitative benthos was done in the western Baltic to determine indicator species and communities. Degree of sewage pollution and type of substrate were considered. The amphipod Batyporeia sarsi, the polychaetes Nephthys caeca, Scoloplos armiger, and Eteone longa, and the bivalve Cardium lamarcki were found to be suitable bioindicators. Sand and eelgrass were considered best indicator communities. (Klein)
W76-01944

REMARKS ON INDICATOR ORGANISMS (MEIOFAUNA) IN THE COASTAL WATERS OF THE GDR,
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
For primary bibliographic entry see Field 5B.
W76-01946

EFFECTS OF A SULPHATE PULP MILL ON THE BENTHIC MACROFAUNA IN A FIRTH OF THE BOTHNIAN SEA,
Swedish Water and Air Pollution Research Lab., Goteborg.
R. Rosenberg, K. Nilsson, and L. Lander.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 289-300, 1975. 7 fig, 2 tab, 14 ref.

Descriptors: *Marine animals, *Pulp wastes, *Benthic fauna, Industrial wastes, Sulfates, Water pollution sources, Sewage, Animal physiology, Toxicity, Crustaceans, Path of Pollutants, Bivalves, Water pollution effects.
Identifiers: *Benthic macrofauna, *Pulp mills, Pontoporeia affinis, Macoma baltica, Mesidothea entoman, Shell growth, Kraft pulping wastes, *Bothnian Sea.

Natrafjarden, a firth in the Bothnian Sea, receives a yearly discharge of organic wastes from a sulphate pulp mill equivalent to about 8000 tons BOD7. The firth is covered with ice for about 4 months of every year and the salinity below a depth of 10m is 5-6% parts per thousand. The organic wastes were transported in the surface water and oxygen depletion was not observed during the investigation period 1969-1972. The benthic macrofauna was sampled at 32 stations (depth 5-57 m), 12 of which were azoic, comprising an area of about 1 km2. Four communities were distinguished with respect to depth and pollution. The most frequently found species were Pontoporeia affinis and Macoma baltica and Mesidothea entomon, of which the two latter were most tolerant of pollution. Shell growth of Macoma and recruitment of Pontoporeia were reduced in polluted areas. Comparisons were made with the fauna of other polluted areas. (Klein)
W76-01947

CHANGES IN PLANKTON RESULTING FROM EUTROPHICATION OF A BALTIC FIRTH,
Gdansk Univ. (Poland). Inst. of Oceanography.
K. Wikor, and M. Plinski.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 311-315, 1975. 4 fig, 7 ref.

Descriptors: *Primary productivity, *Eutrophication, *Phosphates, Water pollution effects, Wastes, Systematics, Polulation, Water quality, *Plankton.
Identifiers: *Baltic Sea.

Research on plankton was carried out in 1955-1972 in the Szczecin Firth. Phosphate concentration increased 5-20 times the level in 1955, probably due to industrial and agricultural pollution. Pollution also caused increased plankton production as well as changing the plankton diversity composition. (Klein)
W76-01948

THE EFFECTS OF FERRY TRAFFIC ON ROCKY SHORE VEGETATION IN THE SOUTHERN ALAND ARCHIPELAGO,
Abo Akademi, Turku (Finland). Inst. of Biology.
O. Ronnberg.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 325-330, 1975. 3 fig, 1 tab, 9 ref.

Descriptors: *Transportation, *Algae, *Littoral, Benthos, Sampling, Biomass, Waves(Water), Population, Methodology, Navigation, Water pollution effects.
Identifiers: *Ferry traffic, Water action, *Littoral zones, Macroalgae, Verrucaria maura, Fucus cesiculosus, *Finland(Aland Archipelago).

The vertical extent of littoral and sublittoral macroalgae along 10 test lines with different degrees of exposure was investigated by means of skin diving. Along the lines directly exposed to the fairway hydrolittoral filamentous algae were found at depths between 0.3 and 1.8 m, while the normal depth for such algae was 0.2-0.6m. The biomass on lines directly exposed to the fairway was 30% less in the hydrolittoral zone and 50% less in the sublittoral zone than on lines sheltered from the ferries' wash. The force of the wash on the shore was measured with spring dynamometers at different distances from the fairway. (Klein)
W76-01949

THE EFFECTS OF FERRY TRAFFIC ON THE ROCKY SHORE MACROFAUNA IN THE SOUTHERN ALAND ARCHIPELAGO: I. THE CLADOPHORA ZONE,
Abo Akademi, Turku (Finland). Inst. of Biology.
H. -R. Fagerholm.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 331-337, 1975. 6 fig, 1 tab, 10 ref.

Descriptors: *Sampling, *Marine animals, *Biomass, Methodology, Navigation, Transportation, Waves(Water), Sampling, Population, *Cladophora.
Identifiers: Ferry traffic, Water action, Finland(Aland Archipelago), *Baltic Sea.

Quantitative macrofauna samples were taken in the Cladophora zone, using an acrylic plastic frame (400cm2). The sampling localities were situated in the northern Baltic at different distances from the navigation route used by ferries passing regularly through narrow straits in the Finnish and Swedish archipelagoes. Two localities were investigated monthly for one year. The composition of the macrofauna is given. The mean biomasses were 1.4 grams/meter2(fresh wt) in the locality close to the fairway and 19.1 grams/meter2in the controlled locality. The corresponding individual numbers were 806/meter2 and 7271/meter2. A simple dynamometer was used to measure the dynamic pressure in the swell acting upon the shores at different distances from the fairway. (Klein)
W76-01950

ALGAL ZONATION ON ROCKY SHORES OUTSIDE HELSINKI AS A BASIS FOR POLLUTION MONITORING,
Helsinki City Engineer's Office (Finland). Water Conservation Lab.
L. Lindgren.
In: Proceedings of the 3rd Baltic Symposium on Marine Biology, Helsinki, No 239, p 344-347, 1975. 1 fig.

Descriptors: *Water pollution sources, *Eutrophication, *Algae, Primary productivity, Water quality, Domestic wastes, Speciation, Bioindicators, *Monitoring, Sampling, Water pollution effects.
Identifiers: *Baltic Sea, *Helsinki(Finland), *Algal zonation, Pollution gradients, Sphacelaria artica, Eurcellaria fastigiata.

The three typical vegetation belts of the Baltic (green, brown, and red algal belts) could not be distinguished in the most polluted (entrophied) district, the inner archipelago of Helsinki. Elsewhere, slight deviations from the normal species composition of the Baltic were observed. The ecology and relative abundance of the individual species also differed from those in clean areas of the Baltic. (klein)
W76-01951

5D. Waste Treatment Processes

A BARGAINING APPROACH FOR PROGRAMMING LEAST-COST WASTE TREATMENT ALONG A RIVER,
North Carolina State Univ., Raleigh. Dept. of Economics; and North Carolina State Univ., Raleigh. Dept. of Business.
D. Airan, J. A. Seagraves, and D. S. Airan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-108. $4.50 in paper copy, $2.25 in microfiche. University of North Carolina Water Resources Research Institute UNC-WRRI Report No 109, August 1975, 62 p, 5 fig, 8 tab, 18 ref, 3 append. OWRT B-054-NC(4). 14-31-0001-3952.

Descriptors: *Cost allocation, *Waste water treatment, *Costs, Standards, *Optimization, Model studies, Permits, *Cost comparisons, *North Carolina.
Identifiers: *Neuse River(NC), Waste discharges, *Discharge permits, Discharge charges, Least costs, Optimum solutions, *Treatment levels.

A model is developed for minimizing waste treatment costs to achieve a given stream standard. An optimum set of treatment levels is calculated using available information about the cost of waste treatment and the effects of waste in different reaches with an assumed procedure for bargaining among waste dischargers. Each discharger is assumed to be responsible for the quality of water in his reach. The optimum solution suggests an optimum set of discharge permits and charges, However, it does not favor any one administrative system or distribution of costs. The model is run to find optimum or least-cost waste treatment levels for the Neuse River of North Carolina. The optimum solution has much less treatment than is currently being used. The costs of present waste treatment are estimated to be $3.7 million per year while the cost of the optimum set of treatment levels is only $1.09 million. (Stewart-North Carolina)
W76-01504

SOLUBILIZATION AND WET OXIDATION OF SUSPENDED AND DISSOLVED ORGANICS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
J. R. Katzer.
Available from the National Technical Information Service Springfield, Va 22161 as PB247-106, $5.50 in paper copy, $2.25 in microfiche. Delaware Water Resources Center, Newark, Completion Report, September 1975. 97 p, 30 fig, 16 tab, 21 ref. OWRT A-027-DEL(1).

Descriptors: *Oxidation, Chemical reactions, Kinetics, Chemical degradation, Sludge disposal, Design, Evaluation, Ultimate disposal, *Waste water treatment, Economics, Sludge, *Organic wastes, Solubility.
Identifiers: Glucose, *Wet oxidation, Process design, Solubilization.

The aqueous-phase solubilization of yeast and the aqueous-phase oxidation of glucose were studied in an autoclave between 150 and 230 C and 0 to 470 psia 02 pressure. The rate of yeast solubilization was first order in solids concentration and involved both rapid oxidation and slower hydrolysis reactions. The aqueous-phase oxidation of glucose was first-order in glucose consumption and in total organic carbon (TOC) removal. Glucose consumption occurs by a thermal (hydrolytic or dehydrative) decomposition and an oxidative mechanism. The activation energy for both glucose oxidation and TOC removal and for yeast solubilization was about 17 kcal per mole. The cost for wet oxidation of sewage sludge was about the same as that for a wet and catalytic oxidation process. However, wet oxidation achieved only 70% COD reduction, whereas wer and catalytic oxidation produced 99% TOC removal.
W76-01506

OPTIMAL PLANNING OF REGIONAL WASTEWATER SYSTEMS AND THEIR IMPACTS ON STREAM QUALITY WITH A CASE STUDY OF THE CARSON RIVER BASIN,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-01524

SEWER LAYING SYSTEM,
For primary bibliographic entry see Field 8 .
W76-01533

APPARATUS AND METHOD FOR PRODUCING AIR BUBBLES IN A BODY OF LIQUID.
Canadian Patent 974,671. Issued September 16, 1975. Patent Office Record, Vol 103, No 37, p 37-72, September, 1975.

Descriptors: *Water pollution control, *Patents, *Bubbles, Equipment, Oil spills.
Identifiers: Surface water pollutants.

An apparatus and method for producing air bubbles in a body of liquid have been patented. The effectiveness of air barriers in restraining surface water pollutants is achieved by equalizing the air pressure in a perforated bubbling hose. An auxiliary distributing conductor carrying high pressured air and interconnected at intervals with the bubbling hose is utilized. (Waltner-FIRL)
W76-01535

RECOVERY SYSTEM FOR OXYGEN FROM WASTE WATER OXYGENATION.
Chicago Bridge and Iron Company, Oak Brook, Ill. (assignee).
K. W. Lange, and J. B. Maher.
United States Patent 3,909,409. Issued September 30, 1975. Official Gazette of the United States Patent Office, Vol 938, No 5, p 2396, September, 1975. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Oxygen, Biochemical oxygen demand, Gases, Carbon dioxide, Recycling.
Identifiers: Oxygen recovery.

A system for the recovery of oxygen from the oxygenation of waste water has been issued a patent. Substantially pure gaseous oxygen is introduced through waste water with a high biochemical oxygen demand (BOD). An effluent stream of g containing oxygen mixed with nitrogen, carb dioxide, water vapor, and other gases present trace quantities is separated from the oxygenat waste water. The effluent stream of gas is fed in a pool of liquid oxygen. This solidifies the carb dioxide and converts the water vapor to ice. A g stream containing oxygen, nitrogen, and tra quantities of other gases is separated from t liquid oxygen. The gas stream is then cooled to temperature sufficiently low to condense only t oxygen in the nitrogen. The condensed a liquified oxygen is separated from the nitrog gas, and returned to the pool of liquid oxyge Liquid oxygen is vaporized from the pool and us to treat additional waste water. (Orr-FIRL)
W76-01536

SEWAGE TREATMENT SYSTEM INCLUDIN EFFLUENT EVAPORATOR,
Coate Burial Vault, Inc., West Milton, Oh (assignee)
K. J. Yost.
United States Patent 3,907,679. Issued Septemb 23, 1975. Official Gazette of the United Stat Patent Office, Vol 938, No 4, p 1837, Septemb 1975. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Wa water treatment, Tanks, Equipment, Conduits, E fluents, *Evaporators.

A patented sewage treatment system is describ which includes a tank buried within the grou This tank has an inlet to receive sewage water a an outlet to discharge a clear water effluent. A evaporation device is provided to evaporate the fluent into the atmosphere. The evaporation equi ment consists of an elongated flexible tubular co duit system of plastic material, which is arrang to form a substantially flat horizontal coil buri within the ground. This conduit system has an in end portion connected to the outlet of the ta which receives the effluent, an outlet end portio and means to vent the outlet end portion to the mosphere above the ground. This is accomplish by means of an air supply tube connected to conduit system along several longitudinally spac intervals of the conduit system. Thus, several streams are produced into the conduit syste producing a longitudinal flow of air in a comm direction within the upper portion of the condu system for discharge as vapor to the atmosphe through the conduit system outlet. (Kramer-FIR W76-01541

THE APPLICATION OF INCLINED TUBES PLATES TO SEDIMENTATION TANKS WASTEWATER TREATMENT.
Water Pollution Research Lab., Stevena (England).
Notes on Water Pollution, No 68, March, 1975 p, 19 ref.

Descriptors: *Separation techniques, *Sewa treatment, *Waste water treatme *Sedimentation rates, Installation, Economi Tertiary treatment, Activated sludge, Biologi treatment, Flow rates, Treatment facilities, Des criteria, Overflow.
Identifiers: *Sedimentation tanks, Inclined tub Solids removal, Overloading.

The use of inclined tubes or plates in existi horizontal flow sedimentation tanks in order to crease the flow rate for solids removal has been vestigated. These have been considered sewage treatment facilities when the capacity the facility has been exceeded by population creases, and extra sedimentation tanks have been constructed to absorb the overloadi Inclined plates were originally produced comm cially for the separation of oil and water and still used for this purpose. While the installation inclined tubes in existing horizontal-flow sedim tation tanks has been successfully done,

dure is recommended only if the temperature influent is not significantly higher (by more ne degree C) than the bulk liquid tempera- nd if the module can be washed down once few weeks or provision is made for in situ ng to prevent growth of algae. From experi-, it was found that sloping tubes or plates are le for uprating overloaded humus tanks, but t applicable for final settlement tanks in the ted sludge process. They are not suitable for y treatment without the use of a flocculant. h tubes or plates are to be used, the sedimen- tank should be designed on the basis of ow rate using the total plan area of the . While the cost of installing sloping tubes is han the construction of a new tank, the c tube module will last no longer than ten . Thus this procedure is suggested only where rary overloading is the problem where a new will be built during the following ten years, en there is a severe limitation on availability d space. (Kramer-FIRL)
01542

MI PUSHES REGIONALIZATION TO P PACE WITH POPULATION,
i-Dade Water and Sewer Authority, Fla.
itsema.
r and Wastes Engineering, Vol 12, No 9, p 24- eptember, 1975. 2 fig, 3 tab.

riptors: *Waste water treatment, *Treatment ties, Waste water disposal, Sludge treatment, ge disposal, Florida, Sewerage, Infiltration, onal development, Activated sludge, Landfill. ifiers: Miami(Fla).

Miami-Dade Water and Sewer Authority has expanding and regionalizing to keep up with apidly growing population of the area. The ram is under the auspices of the Water Quality agement Plan (WQMP) for Dade County, da. The plan includes the expansion of the inia Key plant from 47 to 110 mgd, the con- tion of an 80 mgd plant, and a 50 mgd plant. A th regional waste water treatment plant (85) will be constructed in 1985. The Virginia Key t is being expanded by the addition of aeration s, final settling tanks, and a 55 mgd pure ox- activated sludge process without primary set- . Sludge will be processed by anaerobic stion, heat treatment, dewatering, and use as a builder and landfill. The 80 mgd plant will use gen activated sludge. Some of the sewage that be processed at this plant will be brackish due alt water infiltration in the sewer lines. The age high in chlorides will be kept separate from sewage low in chlorides, and the treatment t units will be operated separately as saline or -saline. Sludge from this plant will be treated at Virginia Key facility. The 50 mgd plant will use ngle stage oxygen activated process, sludge kening, anaerobic digestion, heat treatment, atering, and sludge cake for soil building. te water disposal from the plants will be ocean all, injection wells, or reuse as cooling water. -FIRL)
5-01546

NITARY LANDFILLS: NO PLACE FOR ACHING,
hards of Rockford, Ill.
oeppner.
ter and Wastes Enginering, Vol 12, No 9, p 47- 53, September, 1975. 7 fig.

scriptors: *Waste water Treatment, *Leachate, ndfills, Water pollution control, Biological tment, Waste water disposal, Irrigation, Waste posal, Groundwater, Costs, Treatment facili- , Plastic pipes, Aerated lagoons.
ntifiers: *Zero discharge.

o discharge of leachate from the inactive Jeff- Sanitary Landfill in Jefferson County, Missou- has been accomplished by a process which in- cludes collection, secondary biological treatment, and land disposal. The leachate system comprises a leachate collection and conveyance system; and aerated faculative lagoon component; a pumping station,; a force main; a surface ridge and furrow land irrigation system; and, a system of monitoring wells. Plastic pipe, installed two feet below the surface of the clay stratum, is used to collect leachate being generated along its entire length by gravity. An impervious plastic liner has also been inserted along the downhill sidewall and bottom of the construction trench. The aerated lagoon operates on the extended aeration principle utilizing a long detention time and a low ratio of organic loading. The expected overall removal of BOD is 85%. The secondarily treated effluent from the lagoon is discharged, using the ridge and furrow irrigation method, to a wooded ridge. An adjacent downslope eight-acre wooded area provides an additional infiltration area to prevent runoff from reaching a stream. Monitoring wells have been installed to determine the efficacy of the leachate collection and irrigation system, and to detect any detrimental effects on groundwater quality. The treatment facilities, pump station, and irrigation system are automatically operated. Total costs for acquisition, construction, and installation of the project were around $49,000. (Orr-FIRL)
W76-01550

LOWER SPEED AERATORS CUT ENERGY USE,
Bird Machine Co., South Walpole, Mass. Wastewater Treatment Equipment.
Water and Wastes Engineering, Vol 12, No 9, p 76-77, 79-80, September, 1975. 6 fig.

Descriptors: *Waste water treatment, *Aeration, Equipment, *Energy, Costs, Economics, Activated sludge, Capital costs, Impellers.
Identifiers: *Aerators.

Very low speed (VLS) aerators for waste water treatment processes can lower the costs of energy while increasing the oxygen transfer efficiency. Oxygen transfer efficiency in surface aerators at a given power level has been improved by innovative impeller design, larger impellers and lower speeds. However, aerators of this type have a higher capital costs than high speed aerators. Low speed surface aerators are the best choice for activated sludge systems. New concepts of tip speed and pumpong can be used to optimize the surface aerator design. Tip speed is only the tangential component of the mixed liquor discharge. Radial and vertical components must be added to the tip speed to determine the absolute discharge velocity from the blade. After design tip speed is chosen, the RPM and impeller size necessary to achieve the speed can be determined. It is advantageous to choose a large impeller diameter because of its higher pumping capacity. Mixing theory requires about five turnovers of a homogeneous fluid for complete mixing within the aeration zone. VLS surface aerators can achieve turnover in 6-10 min, for the same power, and increase actual oxygen transfer efficiency. The larger gear reducer and impeller required for VLS surface aerators increases the capital cost. However, the annual power cost savings effected by VLS aerators can offset the increased capital cost well within the usual industrial amortization time of three to five years. (Orr-FIRL)
W76-01552

WE MUST IMPROVE CHLORINATION DESIGN,
MCA Engineering Corp., Baltimore, Md.
C. M. Robson, B. S. Hyatt, Jr., and S. K. Banerji.
Water and Wastes Engineering, Vol 12, No 9, p 61-66, 68, September, 1975.

Descriptors: *Waste water treatment, *Disinfection, *Chlorination, Chlorine, Mixing, Analytical techniques, Measuring, Equipment, Design.

More stringent standards for the disinfection of waste water necessitates the improvement of chlorination practices. Recent standards concerned with virus inactivation call for free residual chlorine levels after one hour of 0.5 mg/liter to 3.0 mg/liter. The most commonly used method of measuring residual chlorine is the orthotolidine method. The amperometric titration method, based on an oxidation reduction procedure, is becoming more commonly used for waste water. Factors affecting the efficiency of the disinfection process include the quality of the influent to the disinfection process, temperature, pH, turbidity, and the presence of materials which exert a chlorine demand. The most important parameters in chlorination are rapid initial mixing, adequate contact time, and a workable automatic chlorine residual control system. Mixing in a chlorine system must be rapid; the ideal mixing time is a fraction of a second. An equation to predict the efficiency of chlorine disinfection is discussed, and a means of statistically analyzing the data from dye testing of contact chambers is illustrated. The most significant factor in the configuration of a chlorine contact chamber has been analyzed to be the length-to-width ratio. Current research on the effects of chlorine residuals on the aquatic environment has demonstrated the need for dechlorination. Sulfur dioxide, sodium bisulfite, sodium sulfite, sodium metabisulfite, and granular activated carbon can be used for dechlorination. (Orr-FIRL)
W76-01554

FUNDAMENTALS OF ELIMINATING ORGANIC WATER POLLUTANTS WITH POLYETHYLENE (GRUNDLAGEN DER ELIMINIERUNG ORGANISCHER WASSERBELASTUNGSSTOFFE MIT POLYAETHYLEN),
L. Weil, and G. Greiner.
Vom Wasser, Vol 43, p 247-257, 1974. 2 fig, 5 tab, 10ref.

Descriptors: *Organic compounds, *Flocculation, *Oil, *Waste water treatment, *Polymers, Polyelectrolytes, Potable water, Adsorption, Laboratory tests.

Waste water samples containing organic pollutants were treated on a laboratory scale to produce potable water in a flocculation plant with an hourly throughput of 400 cu m. Similar treatment was given to slightly polluted groundwater and bank-filtered river water for comparison. Polymer substances were added to the organic compounds before flocculation; these polymers were an emulsifier-free dispersion of a copolymer of ethylene and vinyl acylamide. Because the disperse plastic had a particle size of only 0.5 micrometers, short contact times were possible. Results indicated that lipophilic organic compounds (such as chlorinated insecticides, petroleum spirit, and crude oil) were removed far more efficiently from the waste water with polyethylene powder than with conventional chemical treatment methods. The addition of the polymer can be implemented in existing treatment facilities without adding further processing stages. Possibilities of applications and economics of the method are discussed. (Kramer-FIRL)
W76-01555

MOTIONLESS MIXERS IMPROVE OXYGEN TRANSFER EFFICIENCIES, PART I,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
K. H. Hsu, L. E. Erickson, and L. Fan.
Water and Sewage Works, Vol 122, No. 8, p 76-79, August, 1975. 6 fig.

Descriptors: *Chemical oxygen demand, *Activated sludge, *Biological treatment, *Waste water treatment, *Mixing, Equipment, Microorganisms.
Identifiers: *Oxygen transfer, Motionless mixers, Koch mixer.

Effects of various types of motionless mixers on oxygen transfer efficiencies are discussed. A multistage cocurrent sieve tray tower system and a cocurrent column packed with Koch mixers were studied. The multi-stage tower type activated sludge process was more efficient than any other known activated sludge process. A bubble column and a six-stage perforated plate column were applied to activated sludge treatment. Sludge in the bubble column caused bulking while sludge from the six-stage perforated plate column had good settling properties. The Koch mixer column removed COD as efficiently as the sieve tray column. Both mixers experienced wall growth by the organisms. (Pinto-FIRL)
W76-01556

UPGRADING HIGHWAY SERVICE AREA WASTEWATER TREATMENT PLANTS,
I. P. Sander.
Public Works, Vol 106, No 10, p 70-72, October, 1975. 1 fig.

Descriptors: *Waste water treatment, *Water supply, *Treatment facilities, *Sewage treatment, Flow rates, Clarification, Chlorine, Standards, Highways, New York.
Identifiers: Highway service, facilities.

Waste water treatment plants and center supply sources operated at highway service areas by the new York State Thruway Authority are discussed. Of 28 service facilities now in use, 27 are served by 24 Authority-owned waste water treatment plants. In 1964, with the aid of a counsulting firm, the water and waste water facilities were surveyed and recommendations for modifications were made. During the past ten years, five primary waste water treatment plants were converted to secondary treatment and others have been enlarged and improved. The Malden area about two hours from Metropolitan New York has encountered an unanticipated increase in peak daily flow. While the 1964 survey predicted a peak flow of 47,000 gpd, by 1972 the flow rate for 24 hours was 86,000 gallons. The plant was therefore redesigned, placing an aerated holding tank in the flow scheme following communition. This allowed a constant flow to be maintained in the primary clarifier so that the unit could function most effieiently. A plastic media packed bed reactor was later added and results were very satisfactory. Treatment plants along the Thruway are generally manned by a single operator, and chlorine handling was made relatively safer by the use of small chlorine containers of about 40 pounds. The summer partonage of the service areas is higher than in the winter and the chlorine containers must be changed more frequently. For each waste water treatment facility, the Authority has National Pollution Discharge Elimination Permits (NPDES) and the update or upgrading of the facilities will be conducted in order to comply with discharge standards. (Kramer-FIRL)
W76-01559

PRECAST CONCRETE PILES CUT PLANT CONSTRUCTION COST,
Onondaga County Dept. of Drainage and Sanitation, N.Y.
For primary bibliographic entry see Field 8F.
W76-01560

WHAT'S NEW IN WATER TREATMENT.
For primary bibliographic entry see Field 5F.
W76-01561

NITRATE REMOVAL BY ANION-EXCHANGE RESINS,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
R. W. Buelow, J. W. Kropp, J. Winthered, and J. M. Symons.
Journal of the American Water Works Association, Vol 67, No 9, p 528-534, September, 1975. 3 fig, 9 tab, 11 ref.

Descriptors: *Nitrates, *Anion exchange, *Ion exchange, Potable water, *Waste water treatment, Pollutant identification, Economic feasibility, Resins, Selectivity, Chemical analysis, Water pollution treatment, Chemical precipitation, Water treatment, Groundwater, Iron, Sulfates, Coasts.
Identifiers: *Nitrate selective resin, Nitrate removal.

High concentrations of nitrate in drinking water obtained from groundwater can cause serious illness or death. An ion exchange process has been developed using a nitrate selective resin which can remove low concentrations of nitrate. A laboratory study was conducted: to test the selectivity ot the resin; to test the performance of the resin when there are high concentrations of nitrate and other anions; to determine the influence of specific ions on resin performance; and to determine the economic feasibility of the process. Other ions used in the study were bicarbonate, silica, chloride, sulfate and iron. In small concentrations the resin shows a preference towards exchange of nitrate over sulphate and other ions, but at higher concentrations, the resin shows a preference for sulfate. In both hard and soft well water, nitrogen removal by the resin was decreased to 25.5% of base capacity. Iron precipitated and caused a fouling problem in the exchange. In studying the influence of specific ions on nitrate removal, it was found that silica reduced nitrate removal to 67.5% of base capacity, sulfate reduced it to 40 to 43.6%, sulfate plus alkalinity reduced it to 33.3%, and sulfate plus alkalinity plus chloride reduced it to 28.2%. Regeneration of the resin in the water was made possible by the addition of sodium chloride. This process becomes more feasible around a coastal area where there is an abundance of salt water. The cost of nitrate removal varies considerably with the quality of water, based mainly on the salt requirement. (Pinto-FIRL)
W76-01562

CONTRACTOR TEAMS TOUCH ALL BASES BUILDING WATER-SIDE SEWAGE FACILITY,
McGraw-Hill World News, San Francisco, Calif.
M. R. Drossel.
Construction Methods and Equipment, Vol 57, No 9, p 40-43, September, 1975.

Descriptors: Construction materials, Treatment facilities, Construction costs, Grouting, Oxygenation, Sludge digestion, Waste water treatment, California.
Identifiers: Oakland(Calif), Laser alignment, Hydraulic hoist, Scaffolding.

Work on the Oakland, California, East Bay Municipal District sewage treatment plant is discussed. The project cost $56 million. Cost saving aspects included concrete conveying and gang-forming for a dozen settling tanks, compartmentalized oxygenation tanks and four sludge digester tanks; tank-riding, self-propelled scaffolds; an outfall pipe submerging and placing system featuring a hydraulic hoist, laser alignment and force-fed rock bedding; and specially grouted and doweled piling. Three settling tanks were built at a time, each one taking 16 days to complete. The four sludge tanks were built in 10 weeks. Laser alignment of a 624 ft addition to an eight foot diameter outfall piping permitted work to proceed in the fog and in the murky waters of Oakland Bay. A premixed non-metallic grout for the securing of the dowells at the tops of the piles was also used to cut installation costs. (Pinto-FIRL)
W76-01563

THE DEVELOPMENT OF A CENTER PIVOT WASTEWATER IRRIGATION MACHINE,
Metropolitan Sanitary District of Greater Chicago. Ill.
G. W. Hall.
Presented at 1974 Winter Meeting of the Americ Society of Agricultural Engineers. December 1 13, 1974. Chicago, Illinois. 5 fig, 2 tab, 7 ref.

Descriptors: *Sprinkler irrigation, *Waste wat disposal, Application methods, Application equi ment, *Irrigation practices, Irrigation water, rigation, Irrigation systems.
Identifiers: *Center pivot irrigation machine.

The center pivot irrigation industry continues improve its product each year. Problem are highlighted by a testing program were correct and incorporated into the manufacturers mo changes for the next year. Probably the most i portant difference between a conventional cen pivot irrigation machine and a wastewater cen pivot irrigation machine is the spray bar conce The low operating pressure requirement provid a lower operating cost because of lower pump costs. However, the high instantaneous appli tion rate of the spray bar concept limits its appli tion to areas where the soil has a high intake rat surface runoff is minimized. The center pi wastewater irrigation machine will continue to b modified conventional center pivot irrigat machine until the wastewater market developes the point where the center pivot industry begins conduct research and development programs. T goal of the wastewater industry and the agric tural industry is the same and that is to hav economical, dependable irrigation machi (Skogerboe-Colorado State)
W76-01565

STATE OF THE ART--ACID MINE DRAINA CONTROL,
Consolidated Coal Co., Library, Pa.
For primary bibliographic entry see Field 5G.
W76-01625

A LOW COST WASTE TREATMENT METH FOR THE DISPOSAL OF DISTILLERY WAS (SPENT WASH),
Walchand Coll. of Engineering, Sangli (India).
B. S. Rao.
Water Research, Vol 6, No 11, p 1275-1282, 19 4 fig, 3 tab, 9 ref.

Descriptors: *Industrial wastes, *Waste wa treatment, *Sewage lagoons, *Waste wa disposal, Pilot plants, Biochemical oxygen mand, Chemical oxygen demand, Organic load Fertilizers, Asia, Hydrogen ion concentration, rigation, Potassium, Costs.
Identifiers: *Distillery wastes, Volatile sol India.

Experimental studies in India indicate that di lery wastes can be treated in open anaer lagoons. An organic loading of 0.604 kg BOI m/day is optimum for a BOD removal efficie of 90-95% and volatile solids reduction of 7 When anaerobic lagoon treatment is followe another lagoon, BOD can be reduced to 600 n COD was 1.38 times the total volatile solids centration for raw spent wash and 1.54 times for lagoon effluent. Lagoons can operate volatile acid accumulation of 21,000 mg/l above pH 6.5 the efficiency is lowered. Su concentrations of 5000 mg/l did not affect formance. Effluents contained 300-500 sulfate/l. Anaerobic lagoon effluent diluted with fresh water was used to irrigate sugar c the deleterious effects of about 5000 kg pot um/ha accumulation in the soil in one year are nown. No deleterious effects were observe the soil, crop, pH, conductivity, and ca exchange. Lagoon depth can vary between 0.9 m, but a 1.8 depth showed better performa The largest distillery in India is now treating entire spent wash (800,000 l/day) in lagoons. COD and BOD of the effluent from the last la is 5000 an 1800 mg/l, respectively. (Bucha Davidson--Wisconsin)
W76-01626

ATING DYE WASTEWATER,
Mills Corp., Greensboro, N.C.
Alspaugh.
le Chemist and Colorist, Vol 5, No 11, p 255-
973. 9 tab, 15 ref.

riptors: *Dyes, *Waste water treatment,
istrial wastes, *Textiles, Biochemical oxygen
nd, Chemical oxygen demand, Biological
nent, Color, Suspended solids, Colloids,
e treatment, Reverse osmosis, Operating
, Chemical precipitation, Filtration, Nutrient
val, Irradiation, Activated sludge, Oxidation
ns, Recycling, Pilot plants.
ifiers: *Textile dye removal.

r management and waste disposal problems
e textile industry are reviewed. There is no
e, economical treatment method. Biological
nent is the most economical, provides good
emical oxygen demand removal, but does not
ve enough color, chemical oxygen demand,
nded solids, and nutrients to be used alone.
th of filamentous organisms cause poor set-
ility. Use of reverse osmosis or adsorptive
s for dissolved organic and color removal
be preceded by chemical flocculation, sedi-
ation, or filtration, otherwise they are im-
ical. Success of carbon adsorption depends
es used and colloidal nature of the liquid to
ltered; chemical pretreatment or sedimenta-
may be required. Hyperfiltration of effluents
omising if cost can be competitive. Gamma
tion to degrade refractory dye colors plus
entration of the organic fraction with an ad-
nt prior to irradiation are possible. The most
tical approach includes reducing water use;
ng relatively clean water; economic study of
nical recycling; development of recycleable
nicals; replacement of toxic dye substances;
of biodegradable compounds; and study of
s directed toward elimination of non-
egradable colors. Today biological treatment
e best choice, possibly in combination with
nical coagulation. (Buchanan-Davidson--
nconsin)
-01629

NSERVING OUR RESOURCES--THE CON-
BUTION OF CHEMICAL TECHNOLOGY,
primary bibliographic entry see Field 3E.
-01630

URVEY OF WASTEWATER TREATMENT
HNIQUES FOR STEEL MILL EFFLUENTS,
S Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
Centi.
'The Steel Industry and the Environment,'
ceedings of the 2nd Furnas Memorial Con-
nce, p 169-198, 1973. 5 fig.

criptors: *Metalurgy, *Steel, *Effluents,
aste water treatment, Mills, Water utilization,
, Suspended solids, Surveys, Oil wastes,
ds, Liquid wastes, Chemical wastes, Metals,
irculated water, Gases, Air pollution.
ntifiers: Coke.

ter pollution problems in the steel industry in-
ve size of operation, large water volumes,
ety of products, and age of the industry. About
0,000 gallons water are used per ton finished
l. Manufacturing process techniques used by
t of the industry are described, divided into
e manufacturing (beehive coke making,
roduct coke manufacture); iron manufacturing
sh furnace, cupola); steel manufacturing (basic
gen furnace, open hearth, electric furnace,
tinuous casting, vacuum degassing); hot form-
(blooming, slabbing, bar, hot strip, structural,
et, plate, seamless pipe, rod, and buttweld pipe
ls); and cold finishing (batch pickling; continu-
pickling; cold rolling; electric weld pipe, screw
nut, and nail mills; cold drawing; tin plating;
coating and galvanizing). Waste water charac-
stics from each are discussed, effluent parame-
ters described, and methods of handling effluents discussed. Principal wastes are suspended solids, oils, acids, soluble metals, and coke plant materials. Treatment methods and efficiency vary with source, volume, and combination of wastes. Some companies provide a well-defined single treatment scheme for total plant effluents. Recirculating and reuse techniques deserve more attention. Waste treatment methods must be carefully planned and monitored. (Buchanan-Davidson--Wisconsin)
W76-01631

SCIENTIFIC SYMPOSIUM ON DAIRY EFFLUENT TREATMENT,
J. S. Cooper, and L. Royal.
The Milk Industry (U.K.), p 25-27, October 1973.

Descriptors: *Conferences, *Dairy industry, *Waste water treatment, Pollution abatement, Byproducts, Analytical techniques, Chemical oxygen demand, Bacteria, Pathogenic bacteria, Water reuse, Trickling filters, Chemical precipitation, Biological treatment, Europe, Sprinkler irrigation, Oxidation lagoons, Biochemical oxygen demand, Economics.
Identifiers: *Denmark, Product recovery.

A symposium organized by the Danish Government Research Institute for the Dairy Industry under the auspices of the Danish Natioanl Committee of the International Dairy Federation was held in 1973. Delegates from many countries presented papers discussing aspects of dairy effluents such as control of waste materials, sampling, analysis, public health, and chemical and biological treatment methods. The conclusions were that an International Dairy Federation group on the subject of dairy effluent treatment should be formed to study control of losses, waste prevention methods, water reuse, sampling, analytical methods, treatment plant economics, sludge disposal, and spray irrigation. Waste prevention and surveys of effluent sources received less attention than treatment processes. Extended aeration plants in the form of oxidation ditches are used on the European continent. Germany had studied high rate filtration with plastic media before use of oxidation ditches. Except for Holland, standards for discharges to water courses were less severe than the United Kingdom Royal Commission Standards and involved only a biochemical oxygen demand requirement which demanded less capital expenditure and operational control. Sludge disposal was given little attention. (Buchanan-Davidson--Wisconsin)
W76-01632

THE TREATMENT OF BLAST FURNACE GAS WASHING EFFLUENT,
British Steel Corp., Wolverhampton (England). Bilston Works.
R. T. Myatt, R. J. Aston, and K. S. Johnson.
Iron and Steel International, Vol 46, No 5, p 421-424, 1973. 3 fig, 3 tab.

Descriptors: *Steel, *Cooling water, *Waste water treatment, *Industrial wastes, Treatment facilities, Design, Pilot plants, Costs, Standards, Carbonates, Dissolved solids, Zinc, Hydrogen ion concentration, Lime, Activated sludge, Chlorine, Oil wastes, Toxins, Phenols, Ammonia, Biochemical oxygen demand.
Identifiers: *Blast furnace cooling towers, *British Steel Corp.(England), Cyanide.

The Bilston Works of Special Steels Division, British Steel Corporation, converted the blast furnace gas washing effluent system to a recirculating system, with sufficient bleed-off to prevent excessive build-up of dissolved solids and problems arising from carbonate scale deposit in pumps, pipework, and cooling tower. Optimum bleed-off volume was about 10,000 gallons/hour. At this rate, the dissolved solids content was 1500-2000 ppm with no marked increase in cyanide and zinc. Pilot plant tests in which pH control with lime was followed by an activated sludge process resulted in variations in cyanide and zinc concentrations over short periods. Chlorine oxidation under alkaline conditions of effluents containing cyanides appeared feasible. Plans for the treatment plant had two phases: first, removal of oil, cyanides, and toxic metals and adjustment of pH by physicochemical treatment; and secondly, removal of phenols, ammonia, and reduction of biochemical oxygen demand by biological oxidation techniques to limits set by the Trent River Authority. The first stage has been operational for one year. The average reagent cost per million gallons effluent was 82.30 British pounds. The second stage plant is being designed to use first stage effluents as feed liquors to produce discharges that meet water quality standards. The plant is described. (Buchanan-Davidson--Wisconsin)
W76-01633

TERTIARY TREATMENT OF PROCESS WATER,
American Oil Co., Whiting, Ind.
A. E. Franzen, V. G. Skogan, and J. F. Grutsch.
Chemical Engineering Progress, Vol 68, No 8, p 65-72, 1972. 7 fig, 9 tab, 5 ref.

Descriptors: *Tertiary treatment, *Waste water treatment, Industrial wastes, Indiana, Oil wastes, Chemical wastes, Coagulation, Flotation, Nutrient removal, Design, Hydrogen ion concentration, Pilot plants.
Identifiers: American Oil Co., Whiting(Ind), Alum.

The waste water stream from the American Oil Company refinery at Whiting, Indiana, required extensive treatment before discharge into Lake Michigan. Three stages of treatment are now in effect. The final step, tertiary treatment by chemical coagulation and air flotation, has been in operation more than a year and is an effective method for removal of contaminants. A second stage treatment called Bio-Flotation, incorporates a series of bio-flotation ponds where biological oxidation, sedimentation, and flotation of biological solids and contaminants occur. Chemical treatment with alum and polyelectrolytes is used to coagulate residual contaminants. Phase separation was accomplished by air flotation. The effluent has a better appearance and phosphates are removed in the final step. Air flotation causes further improvements in biochemical oxygen demand, total oxygen demand, threshold odor number, pH, turbidity, phenolics, oil, and suspended solids. The driest scum is probably produced when skimmers are operated at a speed no greater than that required to keep up with scum production. The design parameters for the air flotation system and performance of the tertiary treatment facilities are given. (Buchanan-Davidson--Wisconsin)
W76-01634

RECOVERY OF MATERIALS FROM THE WASTEWATER FROM WINE DISTILLERIES BY DRYING THE MIXTURE OF SOLID AND LIQUID WASTES,
Water Supplies of Languedoc-Roussilon (France). Regional Board of Management.
G. Ducellier.
Water Research, Vol 7, No 4, p 595-598, 1973. 9 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Drying, *Byproducts, Solid wastes, Liquid wastes, Europe, Fertilizers, Feeds, Nutrients.
Identifiers: *Wine distilleries, *Wine dregs.

Undiluted wine distillery waste has a biochemical oxygen demand above 100,000. Until recently effluents of wine dregs distillation were discharged into lagoons or water. Spent wine is more difficult to purify than domestic sewage. After chemical and biological treatment, diluted spent wine still has a BOD of 600-3000. During biological treat-

ment, degradation rates vary according to size and complexity of the molecules. Purification frequently decelerates with high loads consequently waste water must be diluted by recycling purified effluent. Reclaiming fertilizer or cattle feed from wine dregs may be more economical than treatment. When mould and distilled dregs were dried in an oven and the open air or completely dried in the open air, the product could be stored for one year and used as sheep feed. The least costly method was to prepare fertilizer by pre-drying in the open air to 65% water content then oven drying to 50% water content. Nitrogen, phosphorus, and potassium were not changed by drying. The dried mixture contained an average of 3.3% nitrogen, 1% phosphorus, and 1.5% potassium. (Buchanan-Davidson--Wisconsin)
W76-01635

SOME EFFECTS OF METALS DISCHARGED IN EFFLUENTS AND POSSIBILITIES FOR THEIR RECOVERY,
Water Pollution Research Lab. Stevenage (England).
J. D. Swanwick, and J. V. O'Gorman.
Chemistry and Industry (G.B.), p 537-540, June 16, 1973. 29 ref.

Descriptors: *Metals, *Sewage, *Reclamation, Effluents, Europe, Zinc, Copper, Nickel, Chromium, Sewage disposal, Chemical precipitation, Anaerobic digestion, Industrial wastes, Sewage sludge, Cadmium, Lead, Toxicity, Electrophoresis, Electrodes, Heavy metals, Recycling, Ion exchange, Reverse osmosis, Activated carbon, Adsorption, Polyelectrolytes.
Identifiers: England.

Metals may be removed from sewage as hydroxides, basic carbonates, or sulfides, depending on metal ion concentration and pH. More zinc, copper, and nickel were removed in activated-sludge than primary sludge. Nitrified effluents removed more copper, nickel, zinc, or chromium. Anaerobic sludge digestion increased the values of industrial and domestic sludge contents of copper, nickel, zinc, chromium, cadmium, and lead. The relative toxicities of nickel, copper, and zinc to plants were 8:2:1, and digested sludge could be safely applied to crops but metals in dewatered sludge cake approached dangerous levels. Heavy metals inhibited anaerobic digestion, but sodium sulfide or cadmium acetate eliminated the inhibition. A silver:silver electrode can be used to monitor soluble sulfides and detect heavy metals built up in sludge. Metals can be recovered by recycling metals and water or by precipitation from effluents and recovering from sludge. Metals can be concentrated by incinerating sludge or treating effluents with lime. Hydrometallurgical recovery processes are more flexible, economical, and cause less pollution than thermal processes. Metals can be recovered from sludge by dissolving in acid, and separating by integrated treatment systems, solvent extraction, ion exchange, reverse osmosis, electrochemical methods, activated carbon adsorption, or formation of complexes with polyelectrolytes. (Buchanan-Davidson--Wisconsin)
W76-01639

WASTE TREATMENT FOR THE PABST BREWERY AT PERRY, GEORGIA,
Wiedeman and Singleton, Atlanta, Ga.
T. R. McWhorter, and R. J. Zielinski.
In: Proceedings 26th Industrial Waste Conference, Part 2, Extension Series No. 140, p 604-612, 1971. 2 fig, 5 tab.

Descriptors: *Treatment facilities, *Design, *Waste treatment, *Industrial wastes, *Georgia, Fluctuations, Biochemical oxygen demand, Suspended solids, Sludge disposal, Sprinkler irrigation, Effluents, Automation, Flow rates, Chemical oxygen demand.
Identifiers: *Breweries, Pabst Brewery, Perry(Ga), Big Indian Creek(Ga).

Big Indian Creek, an unpolluted stream high in dissolved oxygen and low in biochemical oxygen demand, solids, hardness, and coliforms, was the receiving stream for treated brewery effluent. Major sources of waste were spent grain press liquor, decant from filter decant tanks, yeast remaining after yeast recovery, spillage, cleaning rinses, and caustic cleaning solution dumps. Variations in flow volume, biochemical oxygen demand, dissolved solids, pH, and temperature were large. The plant was designed to treat 7500 bbl waste/day. Waste was collected in seven systems as uncontaminated cooling water, cooling tower blow down, sanitary sewage, diatomite filter backwash, spent caustic cleaning solution, high strength process waste, and other process wastes. The anticipated waste loads and limited stream assimilation capacity required removal of 97% biochemical oxygen demand and 95% suspended solids. The treatment process was multi-stage with coarse screen, grit chamber, primary clarifiers, plastic media trickling filters, activated sludge basins, final clarifiers, effluent polishing lagoon, aerobic sludge disgestion basins, sludge lagoons, and sludge sprays. Raw waste flow averages one million gallons/day. Average monthly chemical oxygen demand removal is 95-97%. The biochemical oxygen demand/chemical oxygen demand ratio decreases throughout treatment. Effluent quality has been very stable. (Buchanan-Davidson--Wisconsin)
W76-01640

LIMESTONE TREATMENT OF RINSE WATERS FROM HYDROCHLORIC ACID PICKLING OF STEEL,
Armco Environmental Engineering, Middletown, Ohio.
J. E. Barker, S. F. Melzer, and R. D. Snook.
In: Proceedings of the 26th Industrial Waste Conference, Part 2, May 4-6, 1971, Purdue University, Lafayetts, Indiana, p 49-53.

Descriptors: *Limestone, *Acidic water, *Waste water treatment, *Steel, Iron oxides, Oxidation, Operating costs, Neutralization, Aeration, Sludge treatment, Filtration, Waste disposal, Treatment facilities, Design, Capital costs, *Ohio.
Identifiers: *Steel pickling water, Ferrous hydroxide sludge, Middleton(Ohio).

Ferrous metals develop oxide coatings during manufacture, which are removed from low carbon steels by acid pickling and rinsing with water, forming spent pickling acid and rinse water. Armco Steel Corporation's Middleton, Ohio Works could handle spent pickling acid, but not acid rinse water. An economical hydrochloric acid rinse water treatment, was developed utilizing limestone neutralization, aeration, and sludge recurculation to oxidize ferrous iron and produce filterable precipitates. Pilot studies indicated that higher temperatures resulted in higher system capacities and filtration rates. At each temperature there was a minimum pH, below which ferrous iron oxidation was incomplete. Since acid rinse water flow at the treatment plant was half that expected, retention times were approximately doubled. Increased aeration tank retention time probably accounted for success in treating waste at lower temperatures. Total effluent iron concentration was less than 5 mg/l, turbidity was low, and pH 6.8-7.1. Sludge was easily dewatered and handled. The lagoon was successfully stocked with fish. One man can handle the treatment facility. At a waste volume of 900 gpm and total acid concentration of 500 mg/l, operating costs, excluding supervision and sludge disposal were $0.24/1000 gal acid rinse water. (Buchanan-Davidson--Wisconsin)
W76-01641

REMOVAL OF ZINC FROM PLATING RINSE WATER BY SIMPLE NEUTRALIZATION,
Dittmann (Carl) and Co., Karlsruhe (West Germany).
M. Rodenkirchen.
Plating, p 698-700, July 1973. 1 fig, 3 ref.

Descriptors: *Waste water treatment, *Zinc, *Neutralization, Separation techniques, Ammonium compounds.
Identifiers: *Plating rinse waters, Sodium hydroxide.

A new leveling bright zinc chloride plating proces using a weak acid, high-performance zinc platin electrode was studied to determine if zinc could b separated from zinc-containing rinse water. Th procedure is economical and easy to control an maintain. Zinc removal from water rinses follow ing this procedure was studied. Rinse water zin concentration depended on cycle time, surfac area and contour of the part, zinc concentration o the plating bath, etc. High zinc concentrations in dicated that the rinsing procedure was faulty. In sufficient rinsing causes white spots on the zin surface. Rinse water samples were diluted an neutralized at pH 8.6. Ammonium ions complexe hydroxyl ions up to about 0.45 g zinc/l. In rins water containing 200 mg zinc/l maximum, zin was quantitatively precipitated. The upper pe missible limit was 450 mg zinc/l. Zinc did not for stable complexes at pH 8.6, so there was no inte ference with NaOH precipitation. The zinc co tent of the supernatant rinse water after th precipitate had settled was within legal efflue limits (3 mg/l); special treatment was not require (Buchanan-Davidson--Wisconsin)
W76-01642

KINETICS OF LIMESTONE DISSOLUTION I ACID WASTE WATERS,
Pennsylvania State Univ., University Par Mineral Processing Section.
T. H. Wentzler, and F. F. Aplan.
In: 'Environmental Control,' C. Rampacek, edit Proceedings of Symposium 101st Annual Meeti American Institute of Mining Engineers, Februa 20-24, 1972, San Francisco, California, p 513-5 4 fig, 14 ref.

Descriptors: *Waste water treatment, *Acid water, *Neutralization, *Limestones, Industr wastes, Kinetics, Sludge, Sulfates, Hydrogen i concentration.

The problem of neutralizing acidic solutions similar to the treatment of coal mine drainag spent steel pickling liquiors, inorganic acid chem cal plant wastes, and copper mine dump leachi These investigations indicated that dissolution limestone in acidic solution is a transport co trolled, a first order reaction with respect hydrogen ion; the dissolution rate thus decrea one order of magnitude for each unit of increase pH. It is possible to spall off gypsum and thick i hydroxide coatings by stirring (ca. 1700 rpm). that rotational speed, gypsum neither precipa on the surface nor inhibits the reaction rate. Fer hydroxy complexes adsorb onto the limestone s face whereas ferric ion and iron hydroxide do n Neither gypsum coatings nor iron hydrox coatings significantly inhibit the limestone dissc tion rate below pH 2 and pH 3. Only between pH 2-3, where iron hydroxy comple predominate, are coatings formed that subst tially reduce the limestone dissolution rate. In dition to acid mine drainage neutralization limestone, this work emphasizes the critical i ion concentration, and particularly pH, plays the formation of adsorbable metal ion hydr complexes and in inhibiting coatings precipitates wherever acidic solutions are neut ized. (Auen-Wisconsin).
W76-01643

EFFLUENT: THE FUTURE WATER SUPPLY
M. W. Askew.
The Milk Industry (U.K.), Vol 73, No 5, p 32 1973. 4 fig, 3 tab.

tors: *Dairy industry, *Waste disposal, demand, Costs, Recycling, Optimization, water treatment, Water conservation, costs, Water reuse, Water utilization, alues, Europe, Effluents.
ers: *Milk wastes, England, Wales.

g use of water in England and Wales (in ex- 5000 mgd) represents practically the whole eadily available resources of good quality nd increased supplies will depend heavily irect and indirect recycling. To protect the sources increasingly stringent controls will ed upon the quality of effluents discharged rcourses. It is therefore inevitable that the industry of both water supply and effluent l will continue to rise. Considerable reduc- water demand and effluent volume can be d by simple procedures. Milk processing are typically easy to degrade biologically s to purify in biological treatment systems. e-use can minimize the total volumes of mployed in, and the quantities of effluent ed by a production unit as well as by recla- and direct reuse. For economic reasons on- luent treatment will become the norm in the ocessing industries and water recovery and ill become a common corollary. It is essen- lanning and designing a system to deal with tion and water management needs cohe- as a function of the water quality require- f unit production operations, and of the fu- sts of new and reclaimed water. (Auen- sin)
644

R QUALITY ASPECTS OF TANNERY EF- NTS DISPOSAL,
al Research Inst. for Shoe and Allied Indus- ottwaldov (Czechoslovakia).
ik, A. Orlita, S. Siska, K. Jansky, and J.

l American Leather Chemical Association, No 7, p 283-295, 1973. 1 fig, 4 tab, 6 ref.

ptors: *Tannery wastes, *Waste water ent, *Waste disposal, Europe, Industrial , Water pollution effects, Organoleptic pro- , Foaming, Toxins, Lethal limit, Bacteria, on abatement, Effluents.
iers: Czechoslovakia.

eet the high water purity standards in oslovakia tannery wastes are treated by nical and biological methods. Examples of logical flow-sheets of a mechanical and cal treatment plant for a factory producing e-tanned and vegetable-tanned leather are il- ed. The mechanically treated water is rged either to a public sewage system for rd biological treatment or to the biological of a separate treatment plant. Treatment ds for high alkalinity, sulfides, chromium and tanning agents residues are described. tlae are given for the optimum method for shing and controlling the activated sludge s. The biological treatment of tannery ef- s by activated sludge meets the established ements for disposal of these waste waters receiving water with due consideration for l dilution. Sludge is dewatered in sludge o a dry content of 25% and can be readily orted and used directly as agricultural fertil- The chromium content of the sludge should xceed 1000 kg/hectare. The potential of ng the chromium in sludges and thus im- g the fertilizer usage exist in the recovery of ium from exhausted liquors. (Auen-Wiscon-

01645

ES FROM THE MALTING AND BREW- NDUSTRY,
Valker.
Pollution Manual, J. R. Fuller, editor. Thun- d Enterprises, Ltd., Harrow, Middlesex, nd, 1972, p 174-179. 13 tab, 10 ref.

Descriptors: *Industrial wastes, *Waste water treatment, Effluents, Organic matter, Biochemical oxygen demand, Activated sludge, Spraying, Waste water disposal.
Identifiers: *Brewing industry, *Malting industry, England.

The various processes of malting, the conversion of malt into beer, bottling, and cask washings disposal, all of which generate high BOD effluents, are discussed. Several methods of treating the effluents in small and large operations are described. One plant consists of a plastic filled biotower followed by a pair of conventional stone filled filters operating on an ADF cycle. It is handling 60,000 gpd at 2000 ppm BOD and has been shown to be capable of producing an effluent with 20 ppm suspended solids and 20 ppm BOD. There is an activated sludge system handling some 1650 lbs BOD per day, though some difficulty is encountered from filamentous growth and sludge bulking and it is necessary to supply both nitrogen and phosphorus. A full scale activated sludge plant in the form of Pasveer ditches was installed at a malting plant and is working successfully. A large scale experiment was tried where malting effluents were disposed by spraying on pasture land. Spent grains and spent hops may be removed as wet solids but in some breweries they are resuspended in water and pumped out as a slurry. Filters are usually powder or sheet types. (Auen-Wisconsin)
W76-01646

NEW WASTE WATER PRACTICES IN DAIRY PLANTS,
CREPACO, Inc., Chicago, Ill.
For primary bibliographic entry see Field 3E.
W76-01647

A FACILITY FOR THE BIOLOGICAL TREATMENT OF A COMPLEX CHLOROPHENOLIC WASTE,
Arkansas Univ. at Little Rock. Div of Life Sciences.
W. F. Evans.
Arkansas Academy of Science Proceedings, Vol 25, p 38-40, 1971. 1 fig, 7 ref. FWQA WPRD 246-01-68.

Descriptors: *Sewage treatment, *Biological treatment, *Herbicides, 2,4-D, 2,4,5-T, Industrial wastes, Arkansas, Aerated lagoons, Oxidation lagoons, Biochemical oxygen demand, Hydrogen ion concentration, Dissolved oxygen, Plankton, Coliforms, Equipment, Biodegradation.
Identifiers: *Jacksonville(Ark), Chlorophenols, Chlorophenoxy acids.

Industrial wastes entering the Jacksonville, Arkansas, sewage treatment facility contain chlorophenols and chlorophenoxy acids from the manufacture of the hormone-type herbicides, 2.4-D and 2.4.5-T. An aeration lagoon was built to aerate the total flow before release into two existing oxidation ponds. Because data collected during a preliminary survey and 12 months following completion of the aeration system had not been released, no firm conclusions on the efficiency of the system can be reached, but preliminary results indicate that the aeration lagoon removed 55 to 89% of the chlorophenols. Overall chlorophenol removal by the lagoon and stabilization ponds was 87 to 94%. Chlorophenoxy acid removal was 30 to 70% in the lagoon and 49 to 80% in the lagoon and oxidation ponds. During plant operation the average biochemical oxygen demand was 15 mg/l, chlorophenols 0.1 mg/l, and chlorophenoxy acids 1.1 mg/l. There was no significant change in pH, dissolved oxygen, or type and number of plankton one year after operation of the plant began. Reduction in the number of coliforms was good in the stabilization pond effluents; counts were high in the summer, low in winter, and intermediate in spring and fall. (Buchanan-Davidson--Wisconsin)
W76-01648

CASE HISTORY ON ACID MINE DRAINAGE CONTROL,
Bethlehem Steel Corp., Pa.
For primary bibliographic entry see Field 5G.
W76-01650

INDUSTRIAL WASTEWATER PUMPS,
Fluor Engineers and Constructors, Inc., Houston, Tex. Process Dept.
For primary bibliographic entry see Field 8C.
W76-01661

STUDIES ON ELECTROLYTIC TREATMENT OF WASTE WATER (I): REGENERATION OF PHOTOGRAPHIC BLEACH SOLUTION, (IN JAPANESE),
E. Torikai, H. Maeda, and Y. Kawami.
Osaka Kogyo Gijutsu Shikenjo Kiho, Vol 26, No 1, p 1-9, March, 1975. 10 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Electrolysis, Recycling.
Identifiers: Photographic processing wastes, Potentiostatic electrolysis, Ferricyanide bleach regeneration.

The regeneration of photographic ferricyanide bleaches using potentiostatic electrolysis was studied. The optimum conditions for the electrolysis include: an anodic potential of 0.5 to 0.7 V vs. SCE; a platinum coated titanium of graphite anode; a graphite or titanium cathode; a bleach solution anolyte; a catholyte of NaOH, KOH, NaBr, KBr in a one mol/liter solution; a ceramic or organic polymer membrane diaphragm; and, a temperature between 20 and 40 C. The current efficiency of the method was 98.5 to 99.8 percent. The sub-reaction of Br(-) to Br was controlled in the potentiostatic method which prevented the undesirable precipitation of Fe(OH)3. In the potential range of 0.5 to 0.7 V, the oxidation reaction of Fe(CN)6(4-) to Fe(CN)6(3-) in the bleach solution was considered as a mass transfer limited reaction. The cell current can be used to control the variation of the Fe(CN)6(4-) concentration in the electrolyte. (Orr-FIRL)
W76-01662

CLEANING UP THE RHINE.
Chemical Age, Vol 111, No 2932, p 20, September 26, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Treatment facilities, Sewage, Biochemical oxygen demand, Sedimentation, Settling basins, Sludge treatment, Incineration, Sludge disposal.

The BASF Ludwigshafen plant is the largest chemicals production site in Europe, producing nearly 6000 different products including about 2.1 million ton/year of fertilizers and the same amount of plastics. In 1964, the BASF began a ten year program to solve its emission problems, and to help clean up the Rhine river. The construction of an effluent treatment plant to handle the industrial wastes and sewage from the city of Ludwigshafen and part of the nearby area of Frankenthal was a major part of the plan. The new facilities will reduce the BOD loading of the waste water streams by at least 95 percent. The wastes are first screened to remove solids greater than 0.8 in. and then sent to four primary sedimentation basins. After activated sludge treatment, the water is passed to 10 secondary sedimentation basins. The sludge is settled for one day in one of five basins and then mixed with recycled ash and ferric chloride and dried in chamber filter presses. The resultant dried mixture with a residual moisture between 50 and 55 percent is then incinerated in fluidized bed furnaces. Future plans include two or more primary sedimentation basins, 10 more secondary sedimentation basins, and four extra sludge thickening basins. (Orr-FIRL)
W76-01663

POLYVINYL CHLORIDE-BASED FILTER MATERIAL,
V. P. Sokolov.
Soviet Patent SU 424581. Issued January 23, 1975. Soviet Inventions Illustrated, Vol W, No 31, p D2, September 9, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Filtration, Plastics, Suspended solids, Polymers, *Patents.
Identifiers: *Polyvinyl chloride.

A patent has been issued for a polyvinyl chloride based filter material for waste water treatment. The efficiency of filtration of waste waters is improved by using the filter material consisting of finely dispersed PVC or its copolymer with vinyl acetate with an addition of 50-80 weight percent of $BaSO_4$ and 20-50 weight percent of the polymer or copolymer. The addition reduces the oxygen demand of the waste water by 45-50 percent and the turbidity by 20-22 times. The filtrate will contain 2-3 mg/liter of suspended and colloidal material. This method was used to treat an effluent from a PVC manufacturing process containing 640 mg/liter of suspended and colloidal polymer particles. This was filtered through a 30 mm layer containing 6 weight percent $BaSO_4$ and vinyl chloride, and 40 weight percent of acetate copolymer. The amount of the oxygen demand was reduced by 45 percent, the turbidity by 20 times, and the solid and colloidal particles to 3 mg/liter. (Orr-FIRL)
W76-01664

PLANNING WASTEWATER TREATMENT BY EXPANDABLE PARAMETER-WITHDRAWAL TECHNOLOGY,
Firestone Tire and Rubber Co., Akron, Ohio.
F. G. Troppe.
Pollution Engineering, Vol 7, No 9, p 65-66, September, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Planning.

An engineering analysis using an expandable parameter-withdrawal technology will help to optimize the cost/benefit/safety requirements of industrial water pollution control and abatement programs. A basic parameter-withdrawal model was employed at a synthetic rubber plant in Akron, Ohio. Each of the primary treatment techniques of waste blending and flow stabilization, bar screening for trash removal, chemical coagulation/flotation for suspended solids removal, pH adjustment, and oil removal were depicted as a series of building blocks performing only the minimum parameter-withdrawal necessary for discharge of the effluent to a municipal treatment plant. The model was utilized at another synthetic rubber plant which required more extensive treatment because the discharged effluent goes directly to a high-quality stream. More consideration must be given to total recycle of a plant's waste water in order for treatment to remain economically competitive. This building block approach is valuable to the pollution engineer in the preliminary planning of new facilities. The approach allows the quick identification and inclusion of major cost items. (Orr-FIRL)
W76-01665

ROTARY DRUM VACUUM FILTRATION FOR CHEMICAL/BIOLOGICAL SLUDGE,
Lubrizol Corp., Deer Park, Tex.
C. W. Brabston.
Filtration Engineering, Vol 6, No 4, p 12-13, 16, May/June, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical industry, Filtration, Sludge treatment, Biological treatment, Dewatering, Lime.
Identifiers: *Rotary drum vacuum filtration.

The waste water from the Lubrizo Corporation's plant in Deer Park, Texas, which produces chemical additives for petroleum products, is treated in a one million gpd treatment plant. Treatment consists of oil separation, equalization, neutralization, aerated lagoon treatment, and final sedimentation. The chemical and biological sludges are thickened prior to combining them for dewatering by rotary drum vacuum filtration. Vacuum filtration was chosen after a series of field tests were performed. The filters selected were eight-foot in diameter by 10 ft length, 250 sq ft Ametek units equipped with 30 hp vacuum pumps. Initial problems with the filter cloth selected were corrected when a polyester cloth (70 x 120 threads per inch) was chosen. Experimentation was performed with various combinations of feeds to find the best combinations for the production of a maximum cake yield at a minimum expense. The best combination was found to be approximately five to eight percent solids for the chemical sludge, and three to five percent solids for the biological sludge. The sludges are combined at a three to one, chemical to biological ratio, conditioned with 100-150 percent lime, and then filtered. The rate of feed varies between 50 and 60 gal/min. The final cake is about 28-35 percent solids. Filter cleaning is accomplished by rotating low pH water from the plant in the vacuum filters for about eight hours. A continuing research program is being conducted at the plant to determine the factors that can be varied and the modes of operations that can be run, in order to have some idea of what to do when new problems occur. (Orr-FIRL)
W76-01666

OZONATION OF PHOTOGRAPHIC PROCESSING WASTES,
Eastman Kodak Co., Rochester, N.Y.
R. W. Bober, and R. J. Dagon.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2114-2129, August, 1975. 11 fig, 3 tab, 14 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Ozone, Biochemical oxygen demand, Chemical oxygen demand, Tertiary treatment, Biological treatment, Biodegradation.
Identifiers: *Photographic processing wastes.

The use of ozone to degrade certain refractory organic wastes and to reduce the BOD and COD of photographic processing wastes has been studied. Various chemicals found in processing solutions were ozonated, individually and collectively, in order to determine whether ozone could be used as a practical combined tertiary treatment after biological treatment of these wastes or whether it would be more practical to treat individual processing solutions selectively with ozone. Work performed on a small laboratory scale indicated that ozone might best be used as a preliminary treatment for overflow color developer solutions, particularly those containing phenidone and hydroxylamine sulfate; as a preliminary treatment for other solutions containing large amounts of thiocyanate, formate, EDTA, or black-and-white developing agents; and, as a tertiary treatment and disinfectant for overall mixed waste after that waste had first been treated biologically. While ozone will not oxidize all the chemicals present in photographic processing effluents, ozone following biological treatment serves to destroy certain organics that biodegrade slowly, removing color and odors. (Orr-FIRL)
W76-01667

COATING RECLAIM AT CONSOLIDATED PAPERS, INC., WISCONSIN RAPIDS DIVISION,
Consolidated Paper, Inc., Wisconsin Rapids.
L. J. Welling, and W. C. Vreeland.
Tappi, Vol 58, No 9, p 105-107, September, 1975. 4 fig.

Descriptors: *Waste water treatment, *Industr wastes, *Pulp and paper industry, Recyclin Costs, Biochemical oxygen demand, Landf Wisconsin.

In March 1974, a system was started to recla and reuse blade coating at the Wisconsin Rap plant of Consolidated Papers, Incorporated. T system was designed from the results of tests r since 1970. A flow diagram of the coating wa clarifier system is presented. The blade coat reclaim system results in a conservation of r materials of about 3-4 ton/day which represen savings of nearly $150,000 on almost 1000 tons blade coating reclaimed in 1974. The solids lo ing, BOD, and quantity of landfill are grea reduced by the system. The tanks, piping, pum valves, automatic controls, and other associa equipment for the system cost about $65,000. T reclaimed coating is added to the size pr coatings. Reclaimed coating color varies but th differences are easily controlled by the compu color control system. It is now necessary to a more antifoamer to the size press coatin Spoilage of the reclaimed coating is anot problem with reuse; the reclaimed coating mus treated properly and used promptly to prev spoilage. (Orr-FIRL)
W76-01668

PROCESS FOR REDUCING THE AMOUNT CALCIUM CONTAINED IN MAGNESIU BASE WASTE SULFITE LIQUOR BY THE U OF AN AMMONIUM COMPOUND AND AD TIONAL CALCIUM,
R. Lahtvee, B. K. Sethi, and W. H. Stark.
Canadian Patent 974,353. Issued September 1975. The Patent Office Record, Vol 103, No 3 1, September, 1975.

Descriptors: *Waste water treatment, *Indust wastes, *Pulp and paper industry, Calcium, Sul liquors, *Patents.

A patent has been issued for a process for re ing the amount of calcium contained in magn um-base waste sulfite liquor. The quantity of ca um contained in such waste sulfite liquor reduced by precipitating the calcium as calc sulfite and separating the precipitate from remaining waste sulfite liquor solution. precipitation is effected by dissolving additi calcium, an ammonium compound, and a so of sulfite ions in the waste sulfite liquor. The monium compound is selected from the group sisting of anhydrous ammonia, ammonium sul aqueous ammonia, ammonium carbonate, monium magnesium carbonate, and ammon hydroxide. (Orr-FIRL)
W76-01669

CONSOLIDATED PAPERS WILL SWI FROM GAS TO COAL AND BARK BY STALLING NEW BOILER.
Paper Trade Journal, Vol 159, No 22, p 17, tember 15, 1975. 1 fig.

Descriptors: *Waste water treatment, *Indus wastes, *Pulp and paper industry, Pollution ab ment, Activated sludge, Aeration, Treatm facilities, Municipal wastes.

A $6 million coal and bark burning boiler and million addition to the pollution abatement f ties are being constructed at the Wisconsin R Division of Consolidated Paper, Incorporated reduction in available natural gas has necessit the switch to coal and bark for power. The boiler plant, to be completed in mid-1976, will be able to burn municipal refuse. The additio the pollution control facilities, to be complet July 1977, will be a secondary treatment which will consist of a 24-hr split basin, low activated sludge system with a 3 mgd capa Two new clarifiers will be installed, and the e ing primary treatment clarifier will be convert

dary clarifier. Plans for the facilities also
subsurface aeration, and a liquid heat
er to maintain bacteriological activity dur-
emely cold weather. (Orr-FIRL)
571

**/AL OF SODIUM CHLORIDE FROM
IILL OPERATIONS,**
virotech Ltd., Toronto (Ontario).
kes.
States Patent 3,909,344. Issued September
5. Official Gazette of the United States
Office, Vol 938, No 5, p 2379, September,
ig.

tors: *Waste water treatment, *Industrial
*Pulp and paper industry, *Pulp wastes,
s, Sodium chloride, Crystallization,
ation.

od for the removal of sodium chloride from
ill operations has been patented. The
is designed to be used in pulp mill process
omprise digesting cellulosic fibrous materi-
a pulping liquor containing a minimum of
ive pulping chemical, separating the pulped
l from the spent pulping liquor, and form-
lid mass containing sodium carbonate from
nt pulping liquor. The patented improve-
to dissolve part of the solid mass in an
s material to form a hot aqueous solution,
sodium chloride in the hot aqueous solu-
d cool the hot aqueous solution to crystal-
drated sodium carbonate almost to the point
ration of the cooled solution with sodium
e. The crystallized hydrated sodium car-
formed is almost completely free from con-
tion by sodium chloride. The crystallized
ed sodium carbonate is separated from the
g saturated sodium chloride solution. The
chloride solution is further evaporated to
sodium chloride which is then separated
e resulting mother liquid. (Orr-FIRL)
672

**PROBLEMS OF TEXTILE MILL-
RATED WASTEWATER TREATMENT IN
LODZ URBAN AGGLOMERATION
TORE PROBLEMY OCZYSZCZANIA
OW PRZEMYSLU WLOKIENNICZEGO
TERENIE LODZKIEJ AGLOMERACJI
KIEJ),**
iedowski.
y Naukowe Politechniki Lodzkiej, Bu-
ctow, No 15, p 69-83, 1975. 5 fig, 3 tab, 15

ptors: *Waste water treatment, *Industrial
, *Textiles, Sewage, Detergents, Biological
ent, Operating costs.
iers: Physico-chemical treatment.

roblems associated with the treatment of
from the textile industry discharged into
nicipal sewage system in the Lodz, Poland,
re presented. The effect of nonionic, only
ly decomposing detergents on the type of
e treatment method chosen are discussed.
rption is proposed as the basis for two
ds of treating sewage containing up to 50
er of these detergents. The cubic content of a
e treatment plant utilizing physico-chemical
ent methods is compared with the capacity
logical treatment plant. Even if two-stage
ical treatment is used, the cubic volume of a
ical treatment plant will be less than the
e of a physico-chemical plant. In addition,
perating costs are lower and the sludge
ms are easier to remedy for a physico-
cal plant. Biological treatment should be
dered as the first stage of treatment in a
n of complete utilization of industrial water
sed cycles. (Takacs-FIRL)
01673

BIOFILTRATION SYSTEM FOR FABRIC PRODUCER.
International Dyer, Textile Printer, Bleacher and Finisher, Vol 154, No 4, p 169, August 15, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Filtration, Plastics, Activated carbon, Color.
Identifiers: *Biofiltration, Flocor.

The original activated sludge treatment system at the Laura Ashley factory in Carno, Wales, G.B., a major producer of fashion fabrics and dresses, was unable to handle the daily flow rate of 100,000 gal, with a BOD level of 1700 mg/liter, suspended solids content of 40 mg/liter, and the presence of solvents. A plant survey and waste treatability study indicated that a combination of high-rate and low-rate biofiltration would be the most economical and effective treatment technique. In the first phase of the two-phase treatment plant, the effluent passes over two towers each packed with 278 cu m of Flocor E high-rate plastic media, and then goes to settlement tanks. The load is reduced by 50 percent and then by 75 percent. The Royal Commission Standard is obtained by final treatment of the waste water over 294 cu m of high-surface-area plastic random media, Flocor RC. Phase 2 of the treatment plant is activated carbon treatment for color removal. (Orr-FIRL)
W76-01674

HYDROCYCLONE FOR CLARIFYING WOOL-WASHING LIQUID,
B. V. Arkhipov.
Soviet Patent SU 440156. Issued February 14, 1975. Soviet Inventions Illustrated, Vol W, No 29, p D3, August 26, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Patents, Equipment.
Identifiers: Wool-scouring liquors, *Hydrocyclone.

A hydrocyclone for clarifying wool-scouring liquid has been patented. The hydrocyclone contains a vessel with a chute for the heavy fraction, a tangentially mounted inlet nozzle, an outlet trough with an outlet nozzle, and a rotor rigidly fastened on a drive shaft. The rotor has external ribs and a conical cavity. The shaft has an axial cavity with radial channels. The improved design of the centrifugal rotor, incorporating the cylindrical and vertically ribbed external surface, will increase the efficiency of clarification of wool-scouring liquid in the initial wool processing treatment. The inner conical cavity of the rotor is connected to the axial cavity of the shaft. The conical cavity increases the area of contact between the fluid and the rotor, as well as the force which throws the heavy fraction towards the walls of the vessel. (Orr-FIRL)
W76-01675

THE TREATMENT OF TEXTILE DYEHOUSE EFFLUENT.
Effluent and Water Treatment, Vol 15, No 8, p 421, August, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Filtration, Clarification, Biological treatment, Pilot plants.
Identifiers: Biofiltration, Flocor, Acalor High Rate Biofilter Plant.

The results of a pilot plant incorporating plastic biofiltration medium to treat effluent from the textile works of John Heathcoat Limited, at Tiverton, G.B., demonstrated that the plastic biofiltration medium was capable of treating the effluent to the standards of the Devon River Authority. As a result of this conclusion, a one mgd full scale treatment plant was designed and installed at the textile works. Since the plant was to be located on the site of the existing raw water concrete and brick clarification lagoon, a new clarifier system had to be chosen. After considering a number of clarification systems, a recirculating solids contact clarifier was picked; this system includes flocculation and clarification within the same compact basin which occupies only 25 percent of the space of the original basin. The treatment facility is an Acalor High Rate Biofilter Plant with 60,000 gal capacity balancing facilities, and automatic pH control and reagent feed facilities. The biofilter tower is packed with 226 cu m of Flocor plastic filter medium. Advantages of the plant include a minimum of space required, little maintenance, and no operational problems. The plastic biofilter can also handle shock loads of BOD. (Orr-FIRL)
W76-01676

THE RECOVERY OF METALS FROM RINSE WATERS IN 'CHEMELEC' ELECTROLYTIC CELLS,
Electricity Council Research Centre, Capenhurst (England).
C. L. Lopez-Cacicedo.
Transactions of the Institute of Metal Finishing, Vol 53, Part II, p 74-77, Summer, 1975. 2 fig, 5 tab, 14 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Electrolysis, Costs, Operating costs.
Identifiers: Chemelec cells, Electrolytic cells.

Electrolytic extraction of metal from plating rinse waters is the only method capable of recovering the metal as pure metal. Chemical precipitation, solvent extraction, ion exchange of reverse osmosis will recover metal as concentrated solutions or sludges. The performance of Chemelec cells is compared with other types of electrolytic cells. Chemelec cells are a combination of mesh electrodes and non-conducting fluidized beds. Experiments were performed with copper, zinc, and nickel deposition in Chemelec cells. The Chemelec process is economical in terms of obtaining a high purity metal deposit from the metal in the rinse waters which can be reused or sold. In addition, the process effects a water savings. A plant using the Chemelec system to recover 20 ton of metal/year would cost around 10,000 pounds for cells, pumps, piping, rectifier, electrodes, and associated equipment. Operating costs would be about 75 pounds/ton of copper, if copper starting mesh is used. Titanium mesh would lower the cost to about 55 pounds/ton of copper. Conventional electrolytic cells would require a larger plant, rectifier, and other equipment than Chemelec cells. The capital costs of a plant employing conventional cells would be about 15,000 pounds and the operating costs would be about 160 pounds/ton copper. In determining the total economics, the costs that can be offset against expenditure (value of the metal recovered and water savings) must be estimated in each situation. Chemelec cells have proved economical in laboratory and pilot plant tests. This process should now be tested in a plating shop. (Orr-FIRL)
W76-01677

PRACTICAL GUIDE TO TREATMENT OF CHROMIUM WASTE LIQUORS,
Allied Chemical Corp., Syracuse, N.Y. Industrial Chemicals Div.
J. Kraljik.
Metal Finishing, Vol 73, No 10, p 49-55, October, 1975. 3 fig, 1 tab, 20 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Chromium, Standards, Legislation, Sewers, Activated carbon, Chemical precipitation, Ion exchange, Evaporation, Treatment facilities.
Identifiers: Electroplating wastes.

Some of the current water pollution control legislation for the electroplating industry and some means of meeting the effluent limitations are discussed. The Environmental Protection Agency (EPA) has stated that effluent limitations should

be based on the weight of pollutant per unit of plated area rather than on ppm so that limitations will not be met by simple dilution of the waste stream. The EPA limitations for existing plants and new plants are listed. EPA has also released standards for the discharge of electroplating effluents into municipal sewers. These standards are designed to protect the operation of municipal treatment plants and to prevent the introduction of any pollutant which may not be adequately treated. Chromium plating wastes can be reduced with sodium metabisulfite, sulfur dioxide and ferrous sulfate in batch, continuous, and integrated treatment systems. Other treatment methods discussed include electrolytic reduction, direct precipitation with barium salts, activated carbon adsorption, ion exchange, evaporation, and electrodialysis. The factors involved in the choice of treatment facilities and method are also discussed. (Orr-FIRL)
W76-01678

AUTOMATIC SYSTEM PURIFIES PRE-FINISH EFFLUENT AT 45 GPM,
Ball Corp., Denver, Colo. Ball Metal Container Corp.
D. A. Davis, and R. F. Reeves.
Industrial Finishing, Vol 51, No 40, p 30-36, October, 1975. 1 fig, 5 photos.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Sewerage, Neutralization, Oily water, Separation techniques.

The treatment plant for the new aluminum can manufacturing plant of the Ball Metal Container Group, Ball Corporation, at Williamsburg, Virgina, automatically handles all effluent generated in producing 1.5 million two-piece cans daily. The wastes are treated at the plant and then released into the James City County sewer system. The discharged wastes must be free of oils, metal ions, suspended solids, floatable materials, flammable substances, and have a pH of 6.5 to 9.0. The liquid wastes originate from the three can washing processes each consisting of six stages. Each can finishing line produces an average of 15 gpm of wash waters. The treatment system consists of a 4-section tank for equalization, chromate reduction, reaction, and neutralization, followed by a thickener for liquid/solids separation, an oil skimmer and collection sump, emergency dump tank, holding tank, and a final sampling and recycling basin. Half of the treated water from the thickener is reused to conserve water and reduce the total plant effluent. The rest of the water is discharged to the sewer system and receives additional biological treatment before being released into the James River. (Orr-FIRL)
W76-01679

FLUID BED INCINERATION OF WASTES CONTAINING ALKALI METAL CHLORIDES,
Dorr-Oliver Inc., Stamford, Conn. (assignee)
E. J. Roberts, and P. A. Angevine.
United States Patent 3,907,674. Issued September 23, 1975. Official Gazette of the United States Patent Office, Vol 938, No 4, p 1835-1836, September, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Patents, *Incineration, Sulfur.
Identifiers: Fluidized bed incineration.

A method for the fluid bed incineration of alkali metal chloride containing wastes has been granted a patent. The process is designed for the fluid bed incineration, in the presence of sulfur or sulfurous compounds, of an aqueous combustible organic waste stream contaminated with a minimum of one alkali metal chloride. A body of particulate material is first fluidized in a reaction chamber by passing an upwardly flowing stream of air through the body. The fluidized body is then maintained at a temperature between 800 C and 1000 C in order to burn the organic material and volatilize most of the alkali metal chloride. The unvolatilized alkali metal remaining in the bed is expressed in terms of water-soluble and water-insoluble sodium. Finely divided SiO2 and at least one metal oxide selected from the group consisting of CaO, MgO, Al2O3, and Fe2O3, are introduced into the reaction chamber for reaction with the remaining portion of alkali metal; this forms high-melting alkali metal crystalline compounds. The gaseous and solid reaction products are finally discharged from the reaction chamber for disposal or further treatment. (Orr-FIRL)
W76-01680

AES PROJECT 32, TREATMENT OF ELECTROPLATING WASTES BY REVERSE OSMOSIS.
Plating and Surface Finishing, Vol 62, No 9, p 877, September, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Reverse osmosis, Membrane processes, Pilot plants.
Identifiers: *Electroplating wastes, Copper cyanide wastes, Zinc cyanide wastes, Zero discharge.

American Electroplaters' Society's (AES) Project 32 is an investigation of the feasibility of using reverse osmosis (RO) for the treatment of electroplating wastes. The main concern is closed-loop treatment of rinse water from specific plating baths with recycle of the valuable plating-chemical concentrate to the plating bath and recycle of the purified water to the rinsing operation. Pilot-scale tests showed that RO was a promising technique for the treatment of rinse water from the following baths: Watts-type nickel; nickel sulfamate; nickel fluoborate; copper pyrophosphate; copper cyanide; zinc chloride; zinc cyanide; and cadmium cyanide. RO did not appear promising for the direct treatment, without nuetralization, of chromic acid wastes. The results from field tests demonstrated the RO can be used to close the loop in copper cyanide plating. Future plans for this project include laboratory tests to be conducted on a zinc cyanide plating solution to determine the stability of the polyamide membrane at high pH values. If the stability is good, a full-scale field demonstration will be conducted using a combined RO-evaporation system for the closed-loop recovery of zinc cyanide rinse water. (Orr-FIRL)
W76-01681

BIOLOGICAL REGENERATION OF ACTIVATED CARBON IN ADVANCED WASTEWATER TREATMENT,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering.
R. L. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 298, $5.00 in paper copy, $2.25 in microfiche. Completion Report, June 1975, 89 p, 29 fig, 7 tab, 16 ref. OWRT A-032-PA (1) 14-31-0001-5038.

Descriptors: *Carbon, *Activated carbon, Sands, *Aeration, Costs, *Waste water treatment, Biochemical oxygen demand, *Chemical oxygen demand, Biological treatment, *Tertiary treatment.

Enhancement of biological activity was used for off-line batch regeneration of exhausted carbon and in aerated contactors for in-situ regeneration. After three off-line batch biological regeneration cycles, the carbon capacity exceeded 1.0 lb COD/lb with no apparent reduction in the COD removal rate compared to virgin carbon. In 200 days of aerated contactor operations the apparent capacity was 1.87 lbs COD/lb carbon. The influent COD of 94.6 mg/l was reduced to 30.4 m/l at 1.5 gpm/sq ft with 25 minutes detention. A parallel aerated sand contactor removed over 140 lbs COD/day per 1000 cu ft (ptcfd) at 340 ptcfd loading rate. Carbon operating costs for small physical-chemical treatment plants could be reduced 50% by using aerated contactors and comparat economic savings can be achieved by using t biological activity in tertiary treatment
W76-01684

THE PREPARATION AND OXIDATIVE PR PERTIES OF FERRATE ION (FEO42-) STUDI DIRECTED TOWARD ITS USE AS A WAT PURFYING AGENT, PHASE II,
Missouri Univ., Columbia. Dept. of Chemistry.
R. K. Murmann.
Available from the National Technical Inform tion Service, Springfield, Va 22161, as PB-247 3 $3.50 in paper copy, $2.25 in microfiche. Missc Water Resources Research Center, Columb Completion Report, October 1975, 17 p. OWRT 109-MO (1) 14-31-0001-5086.

Descriptors: Water pollution, Water treatme *Waste water treatment, *Oxidation, Water pur cation, *Ions, *Iron oxides, Odor, Bacteria, Se mentation rates, *Viruses.
Identifiers: *Odor removal.

The effectiveness of FeO42- as a water purify agent is described with respect to increasing s mentation rates, removing foreign positive negative ions, oxidizing organic and inorganic s stances, inactivating virus, destroying bacteria odor removal. Studies on stability to stor methods of preparation and cost estimation h been made with the conclusion that in many ty of water purification, Fe042- has advantages o existing means. Theoretical studies on oxy transfer, mechanisms of reaction and the Fe042- are summarized. (See also W75-02707)
W76-01687

CLEANING COAL WITH COAL: COAL HU ACIDS FOR REMOVAL OF ACID, IR HEAVY METALS, AND ORGANIC POL TANTS ASSOCIATED WITH USE OF COAL A FUEL,
Missouri Univ., Columbia. Dept. of Chemistry
S. E. Manahan.
Available from the National Technical Info tion Service, Springfield, Va 22161, as PB-247 $4.00 in paper copy, $2.25 in microfiche. Miss Water Resources Research Center, Colun Completion Report, August 21, 1975. 39 p, 5 f tab, 1 ref. OWRT B-110-MO (1) 14-31-0001-41

Descriptors: *Coal, Acid mine water, *Humic acids, Copper, Cadmium, Neutraliza *Ion exchange, Chelation, Heavy metals, Or wastes, *Waste water treatment, Acids, C exchange, *Missouri.
Identifiers: Surface oxidized coal.

Cation exchangers were prepared by surfac idizing Missouri bituminous coal with 6 M acid through which air was bubled. The trea introduces oxygen-containing functional g on the coal surface producing an ion exch with acid-base properties and the capabili chelating metal ions. The sodium form of th exchanger removed sulfuric acid from wate ing the pH from 1.5 to more than 8. Ferrous i 25 mg/l in pH 1.5 sulfuric acid (Simulating mine water) was removed to less than 0.2 m the sodium form of the ion exchanger. A s solution of ferric iron was lowered from 10 to about 0.5 mg/l by the same treatment treated coal was found to chemically reduce iron (III) to iron (II). When passed over th form of the coal ion exchanger, copper and c um levels in neutral solution were lowered fr mg/l to 0.01 and 0.00 mg/l, respectively, and 50 mg/l to 0.02 and 0.01 mg/l respectively. Th ion exchange capacity of surface treated limits its usefulness in treating water. Base-s coal humic acid has a much higher ion exc capacity, and work is continuing on its u wastewater treatment.
W76-01688

ORS AFFECTING SLIME ACCUMULA- IN FIBERBOARD MILL PROCESS ER,
n State Univ., Corvallis. Dept. of biology.
Minelli, and A. W. Anderson.
able from the National Technical Informa- ervice, Springfield, Va 22161, as PB-247 278, in paper copy, $2.25 in microfiche. Oregon Resources Research Institute, Corvallis, letion Report WRRI-36, October 1975. 59 p, 5 tab, 36 ref. OWRT A-026-ORE (1).

iptors: *Sludge treatment, Slime, *Activated ; *Waste treatment, Waste water treatment, , Aeration, Industrial wastes, Water pollu- ontrol.
fiers: *Mill process water, Fiberboard, ichum candidum.

bjectives were to determine the causes of formation in activated sludge treatment and ommend possible control measures. The pri- problem was a seasonal filamentous bulking was caused by the mold, Geotrichum can- . During the winter, mycelial fibers ap- d and formed a free floating mesh which har- a community of bacteria, yeasts and rs. The highly encapsulated mycelial fila- were assumed to utilize the free wood su- o form its capsular polymer. The biological formation of free wood sugars into erized slime could be followed through the ent steps by gas-liquid chromatography. esearch data indicated that by by-passing the ry settling basin, thus avoiding the anaerobic dation of the free wood sugars, the formation troublesome polysaccharides in the aeration could be avoided. After a rapid screening to ve the particulate matter, direct aeration at a f approximately 7.0 allowed a well balanced, lamentous, microbial population to minate.
01689

E OF NITROGEN IN SEWAGE EFFLUENT LIED TO SOIL,
cultural Research Service, Phoenix, Ariz. r Conservation Lab.
rimary bibliographic entry see Field 5B.
-01696

CESS FOR THE CLARIFICATION OF NE,
national Minerals and Chemical Corp., rtyville, Ill (assignee).
. Dancy.
Patent No 3,904,520, 6 p, 6 ref; Official tte of the United States Patent Office, Vol No 2, p 766, September 9, 1975.

riptors: *Patents, *Brines, *Brine disposal, ste water treatment, *Water pollution treat- t, Floculation, *Liquid wastes, Slurries, Mix- Filtration.
tifiers: Sylvinites.

inite plant brine thickener underflow, which prises an essentially saturated sodium ride-potassium chloride brine containing clay es in amount such as 5% and ore fines in unts such as 20%, is clarified to provide an es- ially solids-free brine by preparing a slurry sisting of an intimate admixture of clear syl- te brine, halite tailings, and a small but effec- amount of a suitable flocculent. The slurry is ated and admixed with an equal or greater unt by weight of sylvinite brine thickener un- low, and the resulting mixture is filtered to ver clarified brine. In a preferred embodi- t, the slurry and underflow are heated prior to ation to dissolve solid potassium chloride in ore fines and the clarified brine is cooled to tallize solid potassium chloride, which is vered. (Sinha-OEIS)
5-01713

INSTALLATION FOR SEWAGE TREATMENT,
Cherne Industrial, Inc., Edina, Minn (assignee).
L. G. Cherne, H. C. Grounds, and H. O. Halvorson.
U.S. Patent No. 3,905,904, 4 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1235, September 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Aeration, *Activated sludge, Microbial degradation, Water quality, Flow control, Equipment.

The invention provides a method of sewage treatment utilizing an acitvated sludge sewage aeration treatment area, such as a sewage treatment channel which provides a variable volume reservoir wherein the volume of sewage under treatment may vary over a substantially broad range, and a sludge settling treatment area. The method comprises the steps of delivering sewage, which is at most partially treated and may include infiltration flow from ground and surface water, into the activated sludge sewage aeration treatment area at variable volume rates which can change from moment to moment during a predetermined daily time period; aerating and circulating the sewage and thereby providing a variable volume mixed liquor of aerated sewage and sludge including microorganisms and solids for further treatment; feeding mixed liquor from the aeration treatment area to the sludge settling treatment area; and treating such mixed liquor at such substantially constant volume rate including separating the sludge from the mixed liquor and discharging the remaining clear liquid effluent from the sludge settling area. The control device may involve a constant volume pump and a control valve which can deliver a constant volume rate regardless of variations in depth. Other flow control devices such as floating weirs can also be used. (Sinha-OEIS)
W76-01715

AEROBIC SEWAGE DIGESTION SYSTEM,
G. A. Milne.
U.S. Patent No 3,907,672, 6 p, 6 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 938, No 4, p 1835, September 23, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Domestic wastes, Water quality control, Water pollution control, *Aeration, *Sludge digestion, Anaerobic bacteria, Aerobic bacteria, Clarification, Equipment.

The invention combines all desirable steps of sewage treatment with a single tank which is self contained. The tank is divided in sections, so that the sewage may be treated in stages. The objectives of the invention are accomplished by providing a large sealed tank with a waste water influent opening into a first pretreatment settlement chamber and with an outflow from that chamber into an aeration chamber where oxygen is added to the air bearing waste water from which solids have been precipitated. The suspended and dissolved solids are acted upon by aerobic bacteria while circulation within the aeration chamber is encouraged. The the aerated waste water is flowed into a tank where flow is slowed and where materials are again precipitated to clarify the liquid. The clarified liquid then flows out of the tank. While the invention is particularly useful for complete sewage treatment systems for single family units and multiple family units, it has application to sewage treatment systems of varied sizes and can be used as an interim sewage treatment facility before a final system is provided. (Sinha-OEIS)
W76-01717

TREATING WASTE,
Fram Corp., East Providence, R.I. (Assignee).
T. E. Belk, S. S. Blecharczyk, and E. L. Shunney.
U. S. Patent No 3,907,673, 4 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 938, No 4, p 1835, September 23, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water quality control, *Filtration, Aeration, Packed beds, Adsorption, Equipment.

The invention provides effective treatment of waste produced in small quantities with apparatus that is self-contained, compact, lightweight (e.g., easily installed and carried on a ship), and inexpensive. The invention features a waste treatment system comprising a receiver tank having an inlet for receipt of waste, means for connecting the reciever tank inlet to a source of the waste, and at least one treatment tank connected downstream of the reciever tank for mechanical filtration of solid contaminants and adsorption of liquid contaminants contained in the waste. The treatment tank has a packed bed of adsorbent particles, means to aerate and fluidize the bed of the treatment tank including an aeration inlet below the bed. The tank has a liquid outlet, a recirculation line connected from the liquid outlet to the upstream of the treatment tank and valves connected for control of flow in the system during a treatment cycle. An aeration and fluidization cycle in which air flows through the inlet of the treatment tank fluidizes and biologically regenerates the adsorbent particles. In the recirculation cycle the waste flow through the recirculation line and down through the treatment tank in the opposite direction as the air flow during the aeration and fluidization cycle to reestablish the bed and discharge loosened solids. (Sinha-OEIS)
W76-01718

PURIFICATION OF INDUSTRIAL WASTE WATER,
Regie Nationale des Usines Renault, Paris (France); and Regie Nationale des Usines Peugeot, Paris (France).
R. A. Basseet.
U.S. Patent No 3,907,682, 4 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 938, No 4, p 1838, September 23, 1975.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Industrial wastes, Water quality control, Water pollution control, Heat exchangers, Heat flow, *Separation techniques, Thermal conductivity, Convection, Currents(Water), Density currents.

An apparatus is described for purifying industrial waste water so that the various phases of different density can be separated. The waste water contains soluble oils or chemically synthesised liquids which are used as additives in cutting and cooling liquids for machine tools used for metal working. This apparatus is located at the first stage of regeneration where the pre-treatment intended to separate the light and heavy phases and the water takes place. The first compartment in the pretreatment tank has an anti-turbulence partition and a thermal partition, and a heating device having a large heat-exchange area. The heating device when operated sets up convection currents between these two partitions to facilitate the separation of the phases. The anti-turbulence partition may take the form of a perforated plate and the heating device is controlled by a regulating thermostat. The convection currents make it possible to separate the various phases contained in the incoming water in such a way that a state of equilibrium is set up in which the light phase, the intermediate phase and the heavy phase come to lie one above the other. (Sinha-OEIS)
W76-01721

PROCESS OF TREATING WASTE WATER,
Fuji Photo Film Co. Ltd., Kanagawa (Japan). (assignee)
A. Abe, and Y. Usui.
U.S. Patent No 3,909,403, 11 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2394-2395, September 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, Ion exchange, *Anion exchange, Separation techniques, Degradation, Chemical degradation.
Identifiers: Photographic processing, Ferrocyanide ions, Ferricyanide ions.

This invention provides a process of treating waste water containing ferricyanide ions and/or ferrocyanide ions which comprises bringing the waste water containing these ions in contact with a weakly-basic anion-exchange resin. The ions from the waste water are absorbed by the weakly-basic anion-exchange resin which is removed and immersed in an alkaline solution to provide an alkaline concentrated solution of the ions. A strong alkali, a hypochlorite and bromide ions are added to the concentrated solution to adjust the pH of the solution to above 12, and the mixture is heated to temperatures above 50 deg C at normal pressure whereby the ferricyanide ions and/or the ferrocyanide ions are decomposed. (Sinha-OEIS)
W76-01726

CLARIFYING AGENTS FOR WATER,
J. L. Lang.
U.S. Patent No 3,909,406, 5 p, 9 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2395, September 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Industrial wastes, Liquid wastes, *Water purification, Flocculation, Suspended solids, Separation techniques, Settling basins.

This invention provides a process which uses a new flocculating system which settles suspended solids from water at a rapid rate, and produces a satisfactorily clear supernatant portion which may be readily removed as purified water. The flocculating and settling agents are physiologically inert, and non-contaminants in terms of the effects of them upon plants and animals. These compounds are essentially those of polyvalent cations with anions such as aluminate, polyaluminate, aluminosilicate, poly aluminosilicate, borate, poly borate, and the like. The materials are prepared by calcining, i.e., heating at temperatures at which water and carbon dioxide are at least partly expelled. The use of these new clarifying agents is easily carried out, usually by simply mixing the untreated water with either the dry pulverized clarifying agent or a slurry thereof in water, allowing flocculation to take place in a quiescent or gently agitated settling zone, and the purified water removed by decantation, siphoning, pumping off, filtration or any of the known methods or combinations. Recycling of the used clarifying agents is possible using these materials, especially when the flocculated solids are incinerated during the ultimate disposal step. (Sinha-OEIS)
W76-01727

TREATMENT OF WOOL SCOURING WASTES,
George W. Bollman and Co., Inc., Adamstown, Pa. (assignee)
W. A. Heisey.
U.S. Patent No 3,909,407, 5 p, 1 fig, 4 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2395, September 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Textiles, *Detergents, Sludge, Heat treatment, Flocculation, Centrifugation, Separation techniques.
Identifiers: *Wool scouring wastes.

The primary object of this invention is to produce a supernatant liquor and a conditioned non-drainable sludge which rapidly, gravity settles so that the supernatant liquor can be discharged directly into a municipal sewer system at acceptable COD levels and the sludge can be continuously and efficiently separated by a solid bowl centrifuge into disposable liquid and solid constituents. A method is provided which will produce sufficient purification of both the liquid and solid components of the wool scouring wastes to permit discharge of these components by conventional methods. In a continuous process the scouring liquor at an elevated temperature is acidified and treated with bentonite while continuously mixing. The acidulated liquid is treated with lime and flocculated while continuously mixing, again at an elevated temperature. Finally the conditioned mixed liquor is transferred to a settling tank where the sludge is removed for further treatment and clear liquid is drawn off for discharge into a sewer system. (Sinha-OEIS)
W76-01728

PROCESS FOR TREATING SEWAGE SLUDGE,
H. H. Neukamm.
U.S. Patent No 3,909,410, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2396, September 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, *Sludge treatment, *Sludge disposal, Drying, Sewage sludge.

An improved method is described for treating sewage sludge. The sludge in the form of a slurry is continuously distributed onto preheated aggregate pieces which are continuously fed into a lower region of a rotating contractor drum. A portion of the slurry instantaneously adheres to the heated aggregate and the non-adhering slurry passes through perforations in the drum for recycle. The aggregate with adhering sludge is carried upward by means of baffles in the drum and is dumped into a collector trough in the upper region of the drum. This coated aggregate is subjected to further heating as it travels down an inclined path to dry the coating into a hard encrustation and enters a tumbler drum which breaks the sludge coating away from the aggregate and pulverizes the sludge into a dust or powder. This dust is collected as product and the decoated aggregate is recycled. (Sinha-OEIS)
W76-01730

MAINTENANCE OF WATER QUALITY,
For primary bibliographic entry see Field 5G.
W76-01735

EXTENDED WASTE WATER PURIFICATION IN A GROUP SEWAGE PLANT AS PROTECTIVE MEASURE FOR A LEAK (WEITGEHENDE ABWASSERREINIGUNG IN EINEM GRUPPENKLAERWERK ALS SEENSCHUTZMASSNAHME),
T. Lanowy.
Vom Wasser, Vol 43, p 193-214, 1974. 12 fig, 4 tab, 11 ref.

Descriptors: *Waste water(Pollution), *Water purification, *Sewage treatment, Flood protection, Potable water, Treatment facilities, *Waste water treatment, Industrial wastes.
Identifiers: *Bystrzyca river(Poland), *Lubachow reservoir(Poland), Sanitation problems, Municipal-industrial wastes.

When water, which was originally impounded for flood protection and energy generation, is used for drinking purposes, it is necessary to reorganize the water and sewage policies in the catchment area of the impounding reservoir and to solve numerous sanitation problems. These problems are discussed with reference to the catchment area of the Bystrzyca river and the Lubachow reservoir in Poland. The intended reorganization of water uses will involve: construction of a group sewage plant for about 15000 cu m waste water/day, including a collector to direct the water around the reservoir; construction of a plant for the treatment of impounded water intended for industry located in the neighborhood of the river basin; incorporation of artificial aeration of the reservoir; and construction of an extensive sewage purification plant fr which water can be fed into the reservoir when flow of main tributary water is low. Since waste water to be handled contains more than 6 industrial effluent from dye-house works, tann factories, spinning mills, and other factories, c siderable difficulties will be met in its treatme particularly with regards to decoloration. T results of investigations carried out in an exp mental sewage purification plant as well as potentiality of recovering drinking water with aid of ion-exchange, electrodialysis, and activa charcoal filtration processes are discussed. detailed program of industrial investigation needed to find the optimum sewage purifica process. (Pinto-FIRL)
W76-01737

SAND FILTER AND WASTE STABILIZATI POND TEST SHOWS POSSIBILITY I TREATMENT OF INDIVIDUAL WASTEWA DISPOSAL,
Public Health Service, Grant, N. Mex. Div. of dian Health.
M. L. Beard, and C. H. Lawrence.
Journal of Environmental Health, Vol 38, No 43-44, July/August, 1975. 1 tab, 10 ref.

Descriptors: *Waste water treatment, *Se tanks, Biochemical oxygen demand, Chemical ygen demand, Nitrates, Coliform, Effluents, S dards, Waste water disposal.
Identifiers: *Sand filters, *Waste stabiliza ponds.

iIn order to determine whether or not waste bilization ponds and sand filters are capabl treating individual dwelling or housing cl wastes to a level of effluent superior to the ventional septic tank, four such ponds and such filters were sampled. Bacteriological, ch cal, and biochemical analyses were made for system. A wide range of loading conditions chosen and each unit was sampled weekly fo month. Sand filters were 20 ft by 40 ft by 4 and were preceded by sedimentation in con tional septic tanks. The waste stabilization p served households receiving untreated well and each was also preceded by a septic tan sedimentation. Effluent samples from all units were analyzed using Standard Method BOD, COD, nitrates, and fecal coliform. The filters produced better BOD, COD, and suspe levels than did the waste stabilization ponds. ever, the performance of the ponds was bet terms of producing a much lower nitrate co tration and low levels of effluent fecal colifo was concluded that both types of units Federal effluent standards and do provide a ble alternative to the conventional septic system for disposal of domestic waste w (Kramer-FIRL)
W76-01738

THE DEGRADATION OF ORGANIC PO TANTS IN WATER BY OZONE (UEBER ABBAU VON ORGANISCHEN SCHADSTO IM WASSER DURCH OZON),
E. Gilbert.
Vom Wasser, Vol 43, p 275-290, 1974. 14 fig, 8 ref.

Descriptors: *Ozone, *Chlorine, Penols, * water treatment, Waste treatment, Oxidatio ganic compounds, *Biodegradation.

In water with an initial pH of 5, ozone is u the oxidative degradation of monochlorophe dichlorophenols, 2,4,6-trichlorophenol 2,3,4,5-tetrachlorophenol. The pr dechlorinates and breaks up the aromatic rin ganic chlorine is converted to chloride, wi yield of the resulting chloride being betwe and 95% of the theoretical value. The yield pendent upon the position of the chlorine with respect to the OH-group and 3.5 to 5 m

e are needed for the complete degradation
mole of chlorophenole, corresponding to
e consumption of 50 to 60%. The oxidation
s were seen to be biodegradable. The ox-
of 2,4-dichlorophenol was not affected by
deoxyribose or glutamic acid. (Kramer-

739

SYSTEM PILOT PLANTS-TWO YEARS' IENCE WITH PURE OXYGEN IN THE ATED SLUDGE PROCESS,
, and R. W. Fuggle.
lic Health Engineer, No 16, p 91-104, July,
ig, 8 tab, 7 ref.

tors: *Activated sludge, *Waste water nt, *Sewage treatment, *Treatment facili-t plants, Oxygen, Sludge.
ers: UNOX, High-purity oxygen activated

NOX pilot plant programs have been con-at three English sewage treatment works, ll, Birmingham; Slack's Valley, Oldham; ltford, Bath. Schematic diagrams are ed for the multistage UNOX system, the pilot plant, and the two-stage system Summaries of the performance of each of t plants are discussed, and several conclu-re made from the results of the studies. plants are capable of operating with high trations of suspended solids and short re-times. Under these conditions, the ef-produced will still contain low BOD and ded solids (SS) concentrations. A fully l effluent has been obtained by using air n following the high rate removal of car-ous material by a UNOX system. Problems eving nitrification at one of the facilities e to the presence of toxic substances and a . Using pure oxygen for sewage treatment intained thick under flow concentrations settling basins except when the sewage ed high concentrations of filamentous or-. The UNOX system has operated without ns when sewage treated contained quanti-filamentous organisms that normally cause bulking in air systems. The activated sludge OX system has a rapid settling rate which little effect from sludge loading ariation.
RL)
1740

NDARY TREATMENT AT LONG REACH,
Villiamson.
onsulting Engineer, Vol 39, No 8, p 31, Au-975.

ptors: *Sewage treatment, *Waste water ent, *Treatment facilities, Activated sludge, uction, Aeration.
iers: Long Reach Sewage Treatment (GB).

on the third and final stage of the extensions ong Reach Sewage Treatment Works nd) has been initiated. This final stage will e secondary treatment and improve sludge ent and disposal, and is an important step in r reducing the poilution of the Thames y. The new plant will treat a dry weather f about 35 mgd. Secondary treatment is ex-l to reduce the effective oxygen demand parameter that expresses the amount of ox-required to oxidize both carbonaceous and enous substances in the effluent) by about Six aeration tanks are to be added together ssociated liquor, settled sewage and return ted sludge channels. Provisions are being for two additional tanks. Each tank will be 26.3 m by 4.4 m. Diffused air will be used to the mixed liquor. Three motor driven turbo-rs are being installed, with provision for two In order to reduce the chances of cracking ncrete due to shrinkage, construction of the floor and walls of the facility will be performed in short IL 'L'-shaped sections. Construction of a given section of a floor will be followed as soon as possible by construction of the corresponding wall section, so that shrinkage of the floor and wall will occur at the same time. (Orr-FIRL)
W76-01741

FACTORS TO CONSIDER WHEN SELECTING GRANULAR ACTIVATED CARBON FOR WASTEWATER TREATMENT,
ICI America Inc., Wilmington, Del.
P. B. DeJohn.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Part Two, Lafayette, Indiana, Purdue University, p 790-807, 14 fig, 12 tab.

Descriptors: *Waste water treatment, *Activated carbon, Lignite, Coals, Bituminous materials, Adsorption, Molecular structure.
Identifiers: Bituminous coal carbon.

The selection and use of granular activated carbon in waste water treatment were studied. Before selecting a carbon type, an analysis of cost is advisable; it should be made through a minimum of five adsorption-regeneration cycles. Performance deterioration and price differences between the two carbon types should also be kept in mind. The choice of a granular activated carbon should be based on its meeting effluent standards through impurity adsorption, on moderate losses during regeneration, on minimal pressure drop, absence of operating problems, and on the most economical operating cost. Adsorption data reveals that lignite carbon will be more efficient in dealing with waste water streams which contain pollutants with mostly large molecules while bituminous coal carbon will be preferable when working on streams with predominantly small molecules. In domestic waters, both carbons should give equivalent results. Regeneration data shows that lignite carbon regenerates more easily and under less severe conditions because of its larger pore structure and its greater inert ash content. (Waltner-FIRL)
W76-01742

OZONE DEGRADATION IN PACKED COLUMNS,
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
M. A. Kessick, and J. V. Matson.
Journal of the Environmental Engineering Division-ASCE, Vol 101, No EE5, p 883-886, October 1975. 2 fig, 4 ref.

Descriptors: Ozone, *Waste water treatment, *Chlorine, *Adsorption, Activated carbon, Zeolites.
Identifiers: Packed columns, *Ozone decomposition.

Ozone has been considered as an alternative disinfectant to chlorine in water and waste water treatment systems. One hazard of ozone treatment is an unacceptable level of gas that might be released to the atmosphere. To minimize this problem, ozone may be adsorbed into potassium iodide solution, thermally degraded in a flare, or decomposed in a packed column. The last of these procedures was evaluated by reaction zone analysis. Destruction of ozone was carried out for both dry and water-saturated gas streams. Carbon column packings of 21-g (49-ml bed volume) dried Pittsburgh Activated Carbon Type SGL 8-30 were used. For purpose of comparison, Linde Molecular Sieve type 13x, a zeolitic material, was evaluated by the same method for ozone decomposition ability. The activated carbon in a packed column demonstrated a performance markedly superior to that of the zeolite. The use of the carbon column was suitable for the continuous removal of small percentages of ozone from a wet or dry gas stream. Carbon was irreversibly degraded at the rate of approximately one g/4 g ozone destroyed. The weight loss (about 0.35 g/4 g ozone destroyed) indicated that a catalytic or thermal mechanism as well as a chemical reaction had contributed to the degradation. (Kramer-FIRL)
W76-01743

SANITARY SURVEYS AND SURVIVAL CURVES OF SEPTIC TANK SYSTEMS,
J. T. Winneberger.
Journal of Environmental Health, Vol 38, No 1, p 36-39, July/August, 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Septic tanks, *Surveys, *Sewers, *Sewerage, Public health, Costs, *Waste water treatment.
Identifiers: Septic tank survival curves.

An argument is presented in favor of reviewing presently operating septic tank systems rather than arbitrarily replacing them with sewers. It is believed that many federally funded sewerage projects have been unnecessary, and have led to urbanization of reluctant communities. Two unincorporated communities in California are compared, both with the same terrain and the same septic-tank practices. One had small, city-size lots and the other had larger lots. While septic tank problems in the city with the small lots were immediately realized when sewage spilled into a neighboring property, in the case of the large lots, nuisances were less often noticed. Survival curves and failure rates for the two systems were compared, and it was found that the small lots had a 17% failure, while the large lots had a failure rate of 15%, or about the same. The survival curves indicated that about 50% of the systems survived 25 years. This rate is deceptive, because the types of repair and amounts of time for the septic tank to again be operable vary. It was recommended that further sanitary surveys be conducted and that the choice of building sewer systems rather than improving septic tanks be re-evaluated. (Kramer-FIRL)
W76-01744

DEVELOPMENTS IN BACKWASHING OF GRANULAR FILTERS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
J. L. Cleasby, E. W. Stangl, and G. A. Rice.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE5, p 713-727, October, 1975.

Descriptors: *Water treatment, *Filtration, *Filters, Equipment, *Waste water treatment.
Identifiers: *Backwashing, *Filter cleaning.

Three methods of backwashing granular filters are evaluated. The effectiveness of: water fluidization only; air-scour followed by water backwash; and surface wash before and during water backwash were tested when filtering different types of waters. Previous studies have shown that the cleaning of granular filters by the upward flow of backwash water alone to fluidize the filter bed is a weak method because particle collisions do not occur in a fluidized bed. Therefore, auxiliary means of improving filter bed cleaning are employed. Experimental testing involved the utilization of three different filters operated in parallel, the filtering of water later followed by two different waste waters, sampling of influent and effluent flows, readings of turbidity and head loss, standard abrasion testing of core samples taken from the media after the backwash, and visual observation. Results support findings on the weakness of water fluidization only, and consolidate the advantages of the auxiliary methods in maintaining the filters in better condition. It was also found that heavy mud ball concentrations are undesirable since they increase initial head losses and help shorten filter cycles; filter cracking will let solids penetrate deeper into the filter and may lower filtrate quality in some instances. Proper backwashing with the auxiliary methods neces-

sitates the expansion of the coals and sands usually specified in dual and mixed media filters. Air-scour systems are described which require special attention in design and utilization. (Waltner-FIRL)
W76-01745

GREATER VANCOUVER OPENS ANNACIS TREATMENT PLANT,
G. Matheson.
Water and Pollution Control, Vol 113, No 9, p 14-16, September 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Automation, *Canada, Dewatering, Chlorination, Operating costs, Personnel.
Identifiers: *Vancouver(BC).

Greater Vancouver (British Columbia) Regional District's recently opened Annacis Island Sewage Treatment Plant is presently providing primary treatment while the Frazer estuary is being tested for possible secondary treatment. The plant is mainly concerned with the elimination of pathogens and toxicity to fish and with the preservation of the estuary's aesthetic qualities rather than with the maintenance of low nutrient levels. Designed to serve 490,000 people by 1986, it is also high automated; an older plant would employ one man per one mgd while the Annacis Island plant uses one man per three mgd. The processes involved in primary treatment comprise influent sampling, pre-chlorination, screening, pumping to preaeration and grit removal, followed by thickening, high rate digestion, and drying and storage in sanddyke lagoons; grit and scum dewatering; post chlorination in contact tanks with dechlorination; and effluent sampling, metering and discharge through an outfall fitted with diffusers. Operating costs are divided among the eleven municipalities according to the value of real property in the collection districts. (Waltner-FIRL)
W76-01746

PROCESS CLOSES LOOP ON SEWAGE TREATMENT.
Chemical and Engineering News, Vol 53, No 40, p 6-7, October, 1975.

Descriptors: *Sewage treatment, *Waste water treatment, *Pilot plants, Activated carbon, Heavy metals, Suspended solids, Standards, Costs.

A pilot plant is to be built in southern California which will test a new treatment process whereby solids in the sewage are converted to activated carbon. These are in turn utilized to treat the incoming waste water. The plant will be a magnification of an already existing mobile unit where the treatment process almost completely eliminated sewage solids, produced clean waste water and removed odors and heavy metals in the sewage. It is expected that the process will exceed EPA standards at a lower cost. (Waltner-FIRL)
W76-01747

ADSORPTION OF INORGANIC MATERIALS ON ACTIVATED CARBON,
Oak Ridge National Lab., Tenn.
F. Nelson, H. O. Phillips, and K. A. Kraus.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Part Two, Lafayette, Indiana, Purdue University, p 1076-1090. 20 fig.

Descriptors: *Waste water treatment, *Activated carbon, *Adsorption, Anions, Cations, Tracers, Analytical techniques, Laboratory tests.

Recent experiments dealing with adsorption phenomena typical of activated carbon are reviewed. The relative extent of anion and cation uptake is determined by means of the 'double tracer technique' and as a function of pH. Small columns are preequilibrated with the electrotype solutions. A solution of the same composition but which contains the appropriate tracer is then passed through the column bed and the effluent is monitored for appearance of the tracer. If the kinetics of exchange is satisfactory, a typical, symmetrical breakthrough curve is obtained. The greater part of the study made use of either commercial, powdered activated carbon Aqua Nuchar A or of a granular coconut charcoal. Most analyses were made radiometrically with appropriate gamma emitting isotopes or by standard atomic methods. Alkali metal separations demonstrated cation exchange properties found at high pH and to a certain extent in neutral solutions of activated carbons. Secondly, the uptake of electrolytes from neutral and slightly acidic solutions was illustrated. A distinction was made between cases where the cation was a metal and where it was the hydrogen ion. Adsorption and separation methods made possible at high ionic strength were examined. Finally, experiments were reviewed where activated carbon is modified by the adsorption of organic acids and by the incorporation of hydrous oxides. (Waltner-FIRL)
W76-01748

TECHNOLOGY AND $20 BILLION ADVANCE WASTEWATER EFFORT.
Engineering News Record, Vol 195, No 13, p 18-31, October 1975.

Descriptors: *Waste water treatment, *Tertiary treatment, Treatment facilities, Costs, Government finance, Sludge disposal, Capital costs.

The construction of advanced water treatment (AWT) facilities to combat water pollution is estimated at two billion. The major impediment is cost. The research budget for AWT has been cut back in recent years; EPA's research allocations are mostly spent on already existing plants and processes. The National Commission on Water Quality's final report on costs and benefits will be released in March and is expected to greatly influence the development of the AWT market. In addition, there is hesitation on the part of municipalities and industries. Some feel that secondary projects not yet put into effect should be given precedence over AWT. Some recommend further research before the project is undertaken but caution against too long a delay. Others want to reexamine the need for AWT at all. Moderate views support the installation of AWT plants where secondary treatment is inadequate. The many processes available to remove remaining pollutants of secondary effluents are reviewed. The largest portion of the AWT research budget is devoted to the problem of sludge disposal. More than forty percent of the capital cost of a treatment plant is utilized in sludge handling. While the United States is more advanced than other countries in AWT technology, Israel, Germany and the USSR all have AWT research or plants. AWT activity is growing in Japan, and Sweden is starting a full-size program. (Waltner-FIRL)
W76-01749

REHABILITATION OF A RECREATIONAL LAKE THROUGH AREAWIDE SEWERAGE.
Public Works, Vol 106, No 10, p 98-99, October 1975.

Descriptors: *Sewerage, *Waste water treatment, *Treatment facilities, Lakes, Rivers, Water quality control, Septic tanks, *Wisconsin, Sewer systems.
Identifiers: Gravity sewers, Lake Koshkonog(Wis), *Lake rehabilitation.

In 1970, a waste water collection system and treatment facilities for sewage from four townships around Lake Koshkonog, Wisconsin, were proposed to replace the existing septic tank systems. The lake shore soil conditions did not favor the continued use of septic tanks, and the construction of areawide sewerage was viewed as a solution to the deterioration of the lake wat quality. A sanitary district was organized, a facilities to accomodate 5590 connections we designed. The collection system for the was water was complicated by having to follow on third of the lake shore and part of the Rock Rive necessitating providing 125,000 linear feet of inch to 24-inch gravity sewers and 25,000 feet force mains. Treatment for the collected wa was provided by the concentration of wastes to single discharge point. An aerated lagoon syste was used, consisting of three lagoons, each with surface area of 2.3 acres. Their combined capac was 18 million gallons, at a flow rate of 600,0 gpd. The lagoons operate in series, and retention the design flow is about 30 days. BOD loading w estimated to be 1020 pounds per day. Monitor and laboratory testing at the lagoons has been i plemented and routine duties include check blower operation, reading meters, recording pr sures and waste water flow and chlorine use, c lecting samples and performing laboratory te for BOD, DO, suspended solids, pH, and chlor residual. The facility has been in operation sin August 1973. While no analytical measurement the lake and river quality have been made since sewerage system was installed, improvement been noticeable in terms of reduced weed gro and odor. (Kramer-FIRL)
W76-01750

ENTERIC VIRUS BEHAVIOR IN SAND DUNI
Technion Israel Inst. of Tech., Haifa. Envir mental Engineering Lab.
E. Lefler, and Y. Kott.
Israel Journal of Technology, Vol 12, No 5/6 298-304, 1974, 3 fig, 6 tab, 17 ref.

Descriptors: *Water reuse, *Waste water tr ment, Recharge, Viruses, Public health, Labor ry tests, Groundwater, Infiltration, Ions, Ana cal techniques.
Identifiers: Sand dunes, Sewage reclamat Israel.

One step in a method of waste water treatmer the planned Dan, Israel, sewage reclamation ject is to infiltrate the water through sand d and pump the recharged water after a lag perio 400 to 800 days. Very little laboratory data e on the investigation of groundwater viral p tion, and the possibilities of public he problems from waste water reuse. This labora study was conducted to obtain a better derstanding about the relationship between vir and the infiltration area for future sewage recl tion projects. To investigate enteric virus beha in sand dunes, bacteriophage f2 and attenu poliovirus 1 were used as experimental vir Particles of these were introduced into columns 4 x 10 cm. The influence of various c concentrations were examined for virus reten No increase of eluted polioviruses were see batch experiments, using several eluents with ferent pH values. While 95% of the reta viruses were released in the first four washes sand still contained poliovirus particles afte successive washings. Experiments with ion dicated that only bivalent cations (which ex effective concentrations in tap water) suc Ca++ and Mg++ may be responsible for vir tention in sand. This should be considere planning waste water reuse through infiltr through sand dunes, to prevent seasonal breakthrough into the groundwater due to which have very low ion concentrations. (Kra FIRL)
W76-01755

LABORATORY STUDIES CONCERNING INFLUENCE OF THE TYPE OF ENERGY SIPATION ON THE AGGREGATION PRO (LABORUNTER-SUCHUNGEN UEBER EINFLUSS DER ART DES ENERGIN TRAGES AUF DEN FLOCKUNGSVORGAN
R. Klute, and H. H. Hahn.

Wasser, Vol 43, p 215-235, 1974. 7 fig, 2 tab,

iptors: *Flocculation, *Coagulation, Mixing, ratory tests, Turbidity, Flow characteristics, tical techniques, *Waste water treatment. fiers: Floc properties, Colloidal charac- cs.

cription of the flocculation and coagulation sses in turbulent flow is presented. Because nt systems require short reaction times and a sity of coagulants are used, the effects of y dissipation of the destabilization and trans- phases is important. This study investigated e the distribution of velocity gradients in the on chamber was significant, and would fore invalidate the concept of an average velocity gradient. Two different clay nsions were coagulated with Na+, Ca2+, Hercofloc at a constant pH. In a jar test, tur- propeller-type and anker-type stirrers were all three stirrers required the same energy in the region of investigated speed. How- the coagulation rates for the stirrers were d to be different, contradicting the premise of erage linear velocity gradient. The anker-type r provided the most uniform distribution of urbulence. This is dependent upon floc pro- es, determined by the colloidal characteristics he coagulant. It was concluded that the dis- tion of turbulence created by different stirrers eaction chamber is an important parameter to nsidered. (Kramer-FIRL)
-01759

EFFECT OF OZONE ON THE DISSOLVED ANIC SUBSTANCES IN THE WATER OF E CONSTANCE (WIRKUNG VON OZON DIE GELOESTEN ORGANISCHEN SUB- NZEN IM BODENSEEWASSER),
primary bibliographic entry see Field 5C.
-01760

ILANI TOWN WASTEWATER RECLAMA- N AND RECYCLING PROJECT,
vaii Univ., Honolulu. School of Public Health.
. Burbank, Jr.
nal of the American Water Works Associa- , Vol 67, No 9, p 487-489, September, 1975. 1 3 tab, 18 ref.

criptors: *Waste water treatment, clamation, *Recycling, Groundwater, Pollu- identification, Irrigation, Biochemical oxida- demand, Chemical oxidation demand, Popula- , Sewage effluents, Sewage treatment, ses, Virucide, DDT, Chlorinated hydrocarbon icides, Phenols, *Hawaii.
ntifiers: Mililani Town(Haw), Infrared spectra, bon chloroform extract, Virucide bromine oride.

as been estimated that Hawaii, which is served ost solely by groundwater supplies, had suffi- t water until the year 2020. However, recent ulation and water use increases have out- pped these estimates. Four years ago a study of reclamation and recylcing of sewage waters for gation was started. A reevaluation of this study a review of carbon chloroform extract (CCE) a is discussed. At the beginning of the study E concentrations for rural, agricultural and wil- e areas indicated excellent water quality. DDT other chlorinated hydrocarbons, indicated in er studies, were not found in detectable ounts. Infrared spectra of organic extracts were complicated to be analyzed, but they did in- ate the possible presence of phenols. Biochemi- oxidation demand and chemical oxidation de- nd were used as indirect measurements of the ount of organic matter, but now direct destruc- n of carbon in the infrared detection total car- n oxidation unit can give a more direct measure- nt. Studies were performed at Mililani Town, waii, on the feasibility of using sewage plant ef- fluent for irrigation. To kill enteric viruses effectively very large amounts of chlorine are needed. Studies on an alternative material, virucide bromin chloride, are suggested. It was also found that data on CCE from sewage are scarce. (Pinto-FIRL)
W76-01764

WATER RENOVATION USING DEEP NATURAL SAND BEDS,
Rensselaer Polytechnic Inst., Troy, N.Y.
. Hajas, N. L. Clesceri, J. Tofflemire, S. Beyer, and L. Hajas.
Journal of the American Water Works Association, Vol 67, No 9, p 510-515, September, 1975. 5 fig, 2 tab, 9 ref.

Descriptors: *Waste water treatment, *Sewage treatment, Infiltration, Flood plains, Effluents, Aerobic conditions, Pollutant identification, Groundwater, Nitrogen, Phosphorus, Treatment facilities, New York.
Identifiers: *Lake George(NY).

Waste water purified by the Lake George Village sewage treatment plant in New York was tested in order to determine whether the final effluent is being safely treated for its ultimate discharge into Lake George. Seepage from the banks of the flood plain of West Brook, which ultimately flow into the lake, was analyzed, and aerobic conditions were found in the groundwater between the treatment plant and West Brook. Samples taken from several wells and other locations were analyzed for temperature, dissolved oxygen, dissolved solids, pH, soluble phosphorus, N03-N, NH3-N, coliforms and chlorides. These samples were made during each season, because the Lake George area has a seasonal increase in population due to summer tourism and a heavy runoff from spring snow melt. It was found that chloride were not diminshed, phosphorus was completely removed, and a nitrified effluent was produced which appears to have no obvious negative effects upon the Lake George water quality. Thus, effluent polishing using infiltration beds does achieve a sufficient degree of purification. (Kramer-FIRL)
W76-01765

THE EFFECTS OF OZONE DEODORIZATION EQUIPMENT FOR THE SEWAGE ODOR (GESUI SHUKI NI TAISURU OZON DASSHUSOCHI NO KOKA),
K. Nishida, T. Honda, and T. Tsuji.
Akushu no Kenkyu, (Odor Control Association Journal), Vol 4, No 20, p 24-30, May, 1975. 5 tab, 11 ref.

Descriptors: *Ozone, *Sewage, *Odor, *Waste water treatment, Sewage treatment, Equipment, Gas chromatography, Photometry, Treatment facilities, Analytical techniques, Measurement, Hydrogen sulfide, Ammonia.

The effectiveness of ozone deodorization equipment for eliminating sewage odors was determined. The concentrations of odor-causing compounds at a sewage treatment plant in Osada, Japan, were measured before and after ozone treatment. The plant in Osaka, Japan, were measured before and after ozone treatment. The plant treated 4000 to 10,000 cu m gas per hr in an ozone reaction bath. The rate of ozone injected into the bath was 150 g/hr. The gas samples before and after the treatment were collected and analyzed by gas chromatography using a flame photometry detector and a PEG 20 M column. The ozone concentration injected into the bath was 1530 to 1710 ppm and the ozone level in the treated gas was 0.13 ppm. The residual ozone was treated at another bath, lowering the ozone concentration to below 0.01 ppm before the final discharge into the air. A gas chromatogram showed 12 peaks, indicating concentrations in the untreated gas of methyl mercaptan, 16.9 ppm; dimethyl sulfide, 1.30 ppm; hydrogen sulfide, 0.30 ppm; ammonia, 0.0052 ppm; trimethyl amine, less than 0.0005 ppm; n-propyl mercaptan, 31.3 ppm; and n-amyl mercaptan, 4.75 ppm. The concentrations of the corresponding compounds in treated gas were: 12.6 to 12.8 ppm; 0.72 to 1.12 ppm; 0.29 to 0.0098 ppm; 0.0026 to 0.0047 ppm; less than 0.0005 ppm; less than 0.01 ppm; and 1.64 to 4.20 ppm. Thus, ozone removal efficiencies were 24.3 to 25.5% for methyl mercaptan; 13.9 to 44.6% for dimethyl sulfide; 3.4 to 96.8% for hydrogen sulfide; 9.7 to 30.8% for ammonia; better than 99.9% for n-propyl mercaptan; and 11.6 to 65.5% for n-amyl mercaptan. (Katayama-FIRL)
W76-01771

WASTEWATER SAMPLE PRESERVATION,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5A.
W76-01772

OPTIMIZATION OF FILTRATION FOR SURFACE WATER TREATMENT (OPTIMIERUNG DER FILTRATION BEI DER OBERFLAECHENWASSERAUF-BEREITUNG),
M. Kavanaugh.
Vom Wasser, Vol 43, p 53-71, 1974. 8 fig, 12 ref.

Descriptors: *Model studies, *Filtration, *Laboratory tests, Polyelectrolytes, Filters, Surface waters, *Waste water treatment.
Identifiers: Particulate collection, Head loss buildup.

A simple model of particulate collection and headloss buildup in granular media filtration has been developed. Assumptions made in design of this model were substantiated through filtration experiments conducted in small laboratory columns (ID = 10 cm) using glass beads as media and latex microspheres as model colloids. One application of the model was illustrated by a hypothetical design problem for contact filter treating a clay suspension destabilized with a cationic polyelectrolyte. By using pilot plant scale tests, the model should be useful in estimating optimum process conditions for a given filtration problem. (Kramer-FIRL)
W76-01775

REPRESENTATION OF MACROSCOPIC FLOW IN AN AERATION BASIN BY A CASCADE FORMED BY TWO UNEQUAL PERFECT MIXERS (REPRESENTATION DE L'ECOULEMENT MACROSCOPIC DANS UN BASSIN D'AERATION PAR UNE CASCADE DE DEUZ MELANGEURS PARFAITS INEGAUX),
Montpellier-2 Univ., (France). Laboratoire de Genie Chimique.
S. Elmaleh, and R. Ben Aim.
The Chemical Engineering Journal, Vol 9, No 2, p 107-114, April, 1975. 10 fig, 1 tab, 7 ref.

Descriptors: *Aeration, *Model studies, Mathematical models, Mixing, Flow measurement, Oxidation lagoons.
Identifiers: *Aeration tanks, Retention time distribution.

Few investigations have been conducted on the mixing in an aeration tank, and either perfect mixing or plug flow has generally been assumed. In this study, the Retention Time Distribution (RTD) was determined in a 12 cu cm tank aerated by coarse bubble diffusers. Mixing was independent of liquid flow in the test range but increased with air flow. The RTD curves were interpreted by a model of two unequal perfectly stirred reactors. Experimental curves were fitted to the model with peak time. Thus, the model parameter was linked to air flow and agreement between experimental and theoretical curves was determined to be good. (Kramer-FIRL)
W76-01778

FACILITIES PLANS: CLEARING UP THE CONFUSION,
For primary bibliographic entry see Field 5G.
W76-01782

EPA MONEY PROPOSALS CAUSE CONCERN,
Passiac Valley Sewerage Commission, Newark, N.J.
For primary bibliographic entry see Field 5G.
W76-01783

CLEAN WATER WILL COST $159 BILLION.
For primary bibliographic entry see Field 5G.
W76-01784

EPA COMPLETES NEW PLANT AND SEWER INDEX DATA SERIES.
For primary bibliographic entry see Field 5G.
W76-01785

ASBESTOS AND CHLORINATED ORGANICS TOP AWWA DISCUSSIONS,
For primary bibliographic entry see Field 5F.
W76-01786

ORGANICS, WATER, AND HEALTH: A REUSE PROBLEM,
California State Dept. of Health, Los Angeles. Water Sanitation Section.
A. W. Reinhardt, D. P. Spath, and W. F. Jopling.
Journal of the American Water Works Association, Vol 67, No 9, p 477-480, September, 1975.

Descriptors: *Water reuse, *Organic matter, *Waste disposal, Waste water treatment, Water supply, California, Public health, Recycling, Recharge, Groundwater, Water resources development, Organic wastes.
Identifiers: Reclaimed waste water.

The use of reclaimed waste water for augmenting domestic water sources is discussed as a major cause for health concern due to effects of stable organic material in the waste water. While reclaimed waste water has been used for crop irrigation of crops with little public contact, the usage has been expanded to include public areas. The last use of reclaimed water has been direct discharge for supply augmentation into a domestic water system or storage facility. The California State Department of Health strongly recommends against the continued use of recharge operations which increase the stable organic loadings of groundwater used for domestic supply. The health effects of such organic materials remain unknown and research is as yet in a preliminary stage. Plans for new spreading and injecting facilities, including the Anaheim Forebay Reclamation Project and the Los Angeles Water Recycling Project, are under review. (Kramer-FIRL)
W76-01789

GOVERNMENT DOLLARS TO FUEL 18% GROWTH IN 1976 SEWERAGE MARKET.
For primary bibliographic entry see Field 5G.
W76-01794

ALARM SYSTEMS PROVIDE LOW COST ENVIRONMENTAL PROTECTION,
Beavin Co., Baltimore, Md.
C. E. Walter.
Public Works, Vol 106, No 10, p 88-89, 112, October, 1975.

Descriptors: *Automation, *Treatment facilities, *Waste water treatment, *Pollutant identification, Equipment, *Monitoring, Installation, Control systems, Costs.
Identifiers: *Alarm systems, System malfunction, Automatic telephone dialer.

The use of automated alarm systems for waste water treatment plants and pumping stations is discussed. To be effective, these malfunction alarms must attract human attention and must generate a response. It is recommended that the alarms be designed to transmit a signal to a remote location which is manned 24 hours a day so that the alarm will receive immediate attention. The types of failures or malfunction that can be detected include power failure, high water, loss of air in an activated sludge plant, excessive turbidity, excessive sludge accumulation, pump or motor failure, primary tank malfunction, high or low chlorine residual, or chlorine gas leaks. The Mount Airy, Maryland, treatment plant is cited as an example where the alarm system has been custom designed and fabricated. A less sophisticated equipment may be used to monitor a small treatment plant, adapting standard burglar alarm components. Receivers of an alarm signal can be placed in a police or fire station so that when a failure alarm is signaled, the appropriate plant operator will be contacted. Another type of burglar alarm system is an automatic telephone dialer, which is activated by the alarm system controller to automatically call as many as four different telephone numbers, sending the recorded message to each. Costs of basic detectors, control unit, and telephone dialer were estimated to be $500 per plant; installation costs should not exceed $500. (Kramer-FIRL)
W76-01795

THE USE OF WASTE HEAT IN A SYSTEM FOR ANIMAL WASTE CONVERSION WITH BY-PRODUCT RECOVERY AND RECYCLING,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. E. Boersma, W. R. Barlow, J. R. Miner, H. K. Phinney, and J. E. Oldfield.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 555, $4.00 in paper copy, $2.25 in microfiche. Oregon Water Resources Research Institution, Corvallis, Report WRRI-38, October 1975. 33 p, 4 fig, 15 tab, 35 ref. OWRT B-039-ORE(3). 14-31-0001-4121.

Descriptors: *Recycling, *Byproducts, Natural resources, *Waste treatment, Algae, Microorganisms, Cultures.
Identifiers: Non-renewable natural resources, Photoautrophic algae, *Waste heat, *Animal waste conversion.

Society faces many problems related to its growth in numbers and standard of living. Of major concern are the consumptive use of non-renewable natural resources and the environmental degradation resulting from pollution. An animal waste management scheme was developed on the premise that one solution to these problems is the development of integrated production systems with recycled resources. It is proposed to use microorganisms to convert animal waste into a high protein animal feed and a methane-rich fuel gas. A conceptual design for such a system is described and results are presented of preliminary experiments conducted in the laboratory. It was decided to use photoautrophic algae for nutrient recovery. Data are presented which demonstrate that based on its mineral composition swine manure is a suitable medium for algal growth. The most encouraging aspect of the laboratory studies has been the stability of the cultures. The average growth rate at 37C during a 12 hour period with a retention time of 3.3 days and a culture depth of 10 cm was about 22 g/m2/day. The consistently high yields of cell dry matter and protein has been encouraging.
W76-01806

PREDICTING THE PERFORMANCE OF FEEDLOT CONTROL FACILITIES AT SPECIFIC OREGON LOCATIONS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W76-01807

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE LEATHER TANNING AND FINISHING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington D.C. Effluent Guidelines Div
J. D. Gallup
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 079 $6.75 in paper copy, $2.25 in microfiche. EPA Report 440/1-74-016-a, Contract No 68-01-0594 March, 1974. 166 p, 6 fig, 70 ref, 24 tab.

Descriptors: *Tannery wastes, *Waste water treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Waste treatment, Water pollution treatment, Standards, Economics, Effluents, Regulation.
Identifiers: *Leather industry.

This document presents the findings of an extensive study of the leather tanning and finishing industry for the purpose of developing effluent limitation guidelines. The guidelines set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the degree of effluent reduction attainable through the application of the best available technology economically achievable; these levels of treatment must be achieved by existing point sources by July 1, 1977 and July 1, 1983, respectively. Supporting data and rationale for the development of the proposed effluent limitation guidelines and standards of performance are presented. Manufacturing processes, wastes, and waste treatment methods and their costs are discussed. (Witt-IPC)
W76-01816

CARBON, NITROGEN, AND PHOSPHORUS REMOVAL IN STAGED NITRIFICATION DENITRIFICATION TREATMENT,
District of Columbia Dept. of Environmental Services, Washington. EPA-DC Pilot Plant.
J. A. Heidman, D. F. Bishop, and J. B. Stamberg
Environmental Protection Agency, Report EPA-670/2-75-052, June 1975. 37 p, 12 fig, 11 tab, 5 ref. 1BB043; ROAP 21-ASO; Task 017. 68-01-0162.

Descriptors: *Nitrification, Carbon, *Sewage treatment, Aeration, Nitrogen, Phosphates, *Activated sludge, Oxides, Sulfates, *Anaerobic conditions, Iron, Chlorides, Oxygen, *Filtration, *Waste water treatment, Dissolved gases, District of Columbia.
Identifiers: *Denitrification, EPA-DC Pilot Plant(Washington DC).

A three-stage activated sludge system with mine addition for nutrient removal was operated w District of Columbia primary effluent. Influ flow followed a programmed diurnal cycle a averaged 205 cu m/day (54,000 gpd). The fi biological reactor was operated as a modified ae tion system with ferric chloride addition for s plemental phosphorus removal. The clarified fluent then flowed to the second reactor for biological nitrification of ammonia and orga nitrogen. Dry lime was used for pH cont Methanol was added to the nitrified effluent, biological denitrification occurred in the final tivated sludge system. Prior to clarification, denitrification effluent was briefly aerated nitrogen gas removal and for consumption of excess methanol. The clarified effluent was th split into two equal streams for comparison of tration performance of a dual-media coal and sa filter with that of a multi-media coal, sand, and menite filter. Effluent quality consistently met proposed D.C. discharge standards of BOD is

or equal to 4.5 mg/l; total N less than or equal 5 mg/l; and P less than or equal to 0.22 mg/l.)
-01865

LE STAGE NITRIFICATION-DENITRIFI-ION,
ict of Columbia Dept. of Environmental Ser-, Washington. EPA-DC Pilot Plant.
Bishop, J. A. Heidman, and J. B. Stamberg.
ronmental Protection Agency, Report EPA-2-75-051, June 1975. 28 p, 5 fig, 8 tab, 15 ref. 043; ROAP 21-ASO; Task 026. 68-01-0162.

riptors: *Nitrification, *Activated sludge, ste water treatment, *Aeration, *Anaerobic litions, Dissolved gases, *Sewage treatment, gen.
tifiers: Nitrogen removal, *Denitrification, ff aeration, Single stage, Nitrification-trification, EPA-DC Pilot Plant(Washington

removal of 75-84% of the nitrogen from pri- wastewaters was achieved in a single stage vated sludge process. The two-pass reactor operated with a food to mass ratio (F/M) of oximately 0.1 gm BOD5/day/gm MLVSS. The was applied on a 30-minute cycle first to one tor pass then to the other pass. Mechanical ers suspended the mixed liquor solids when the was not applied. The D.O. concentration varied n 0.0 mg/l without air to 2-3 mg/l during aera-. In June with a 9-hour detention time in the tor, the residual pollutant concentrations raged 23 mg/l of COD (90% removal), 3.8 mg/l otal nitrogen (84% removal) and 7.8 mg/l of pended solids (93% removal). In February, n a 12-hour reactor detention time, the residual utants averaged 25 mg/l of COD (89% oval), 6.0 mg/l of Total N (75% removal) and ng/l of suspended solids (87% removal). Since nitrate from nitrification was used to remove D5 from the wastewater, the process ad-tages for single stage nitrification-denitrifica- included the reduction in the amount of air ded to achieve BOD5 removal and nitrifica-; the minimizing of supplemental organic car- sources for denitrification; and the elimination clarifiers in staged nitrification-denitrification. PA)
6-01866

MOVAL OF CHROMIUM FROM PLATING NSE WATER USING ACTIVATED CARBON,
ttelle, Columbus Lab., Ohio.
B. Landrigan, and J. B. Hallowell.
vironmental Protection Agency, Report EPA-0/2-75-055, June 1975. 43 p, 10 fig, 6 tab. 1BB036 OAP 21AZO, Task 17). S-802113.

scriptors: *Activated carbon, *Activated car-n, Adsorbents, *Adsorption, Industrial wastes, aste water treatment, *Chromium.
ntifiers: Rinse water, Waste recovery, Metal ishing, Electroplating.

romium is a major pollutant in wastewaters m some electroplating operations. It can be ef-ctively removed from rinse waters by adsorption activated carbon, which must be regenerated en saturated with chromium to its upper limit. is study was concerned with the best means of generating the carbon under conditions which ould return it as closely as possible to its original sorptive capacity. The tests were conducted (1) a laboratory scale to determine the effects of sic and acidic media on regeneration of chromi-n-loaded activated carbon and (2) in a small pilot ant unit on the basis of the best results of the oratory-scale work. In the latter case, tests ere conducted on the unit operation for eight ad-rption-desorption cycles. The overall results ggest that a chromium removal unit could be in-alled in many of the small plating plants, reliev-g the burden on municipal sewage systems, and bringing the plating plant into compliance with local and Federal regulations. Recommendations for improvement of the regeneration process are given even though the process could be used in its present stage of development. (EPA)
W76-01867

METHODS TO TREAT, CONTROL AND MONITOR SPILLED HAZARDOUS MATERIALS,
Calspan Corp., Buffalo, N.Y.
For primary bibliographic entry see Field 5G.
W76-01869

MULTI-PURPOSE COMBINED SEWER OVERFLOW TREATMENT FACILITY, MOUNT CLEMENS, MICHIGAN,
V. U. Mahida, and F. J. DeDecker.
Environmental Protection Agency, Report EPA-670/2-75-010, May 1975. 204 p, 45 fig, 19 tab, 24 ref, 3 append. 1BB034; ROAP 21-ASY; TASK 149. 11023 FAR.

Descriptors: Cost comparison, Water quality, *Filtration, Sewers, *Chlorine, Surface runoff, *Water supply, Water conservation, *Overflows, Recreational facilities, Standards, Storage, *Disinfection, *Chlorination, *Combined sewers, *Waste water treatment, Treatment facilities.
Identifiers: *Microstraining, *Combined sewer overflow, *Storm runoff, Urban water management, Multi-purpose treatment, Clemens(Michigan), Stormwater reuse.

Combined sewer overflows from 212 acres within the City of Mount Clemens were conveyed to a treatment-park site. The overflows received initial treatment (settling and surface aeration) in a retention basin. Further treatment consisted of microstraining disinfection, surface aeration in a series of lakelets, and filtration. The annual existing overflow of 2180 cu ft/acre-inch of rainfall had SS of 50 lbs/acre-inch and BOD5 of 20 lbs/acre-inch. Treatment reduced the annual pollution load by 90 percent. The final lake sampling data had demonstrated that all water quality parameters for fishing, boating, and/or lawn sprinkling--except the toxic and deleterious substances parameters, which were not studied--were met. Very limited investigations were undertaken in the area of recreation, open space, and transitional land use. Treatment of combined sewer overflows was more cost-effective than separation of an existing combined sewer system. (EPA)
W76-01874

GUIDELINES FOR THE DISPOSAL OF SMALL QUANTITIES OF UNUSED PESTICIDES,
Midwest Research Inst., Kansas City, Mo.
E. W. Lawless, T. L. Ferguson, and A. F. Meiners.
Environmental Protection Agency, Report EPA-670/2-75-057, June 1975. 330 p, 4 fig, 12 tab, 166 ref, 5 append. 1BB041; ROAP 21AVO; Task 002. 68-01-0098.

Descriptors: *Pesticides, *Herbicides, *Insecticides, Waste treatment, Waste disposal, Incineration, Neutralization, Oxidation, Reduction(Chemical), Degradation(Decomposition), Water pollution treatment.
Identifiers: Pesticide spills, Pesticide manuals, Pesticide disposal.

Information has been compiled and organized that will be useful to responsible authorities in advising the layman (particularly the homehowner and small farmer) how to dispose properly of small amounts of surplus and unwanted pesticides and pesticide containers, and in treating pesticide spills. The report brings together available information on pesticide disposal methods and on over 550 individual pesticides, and evaluates this information in terms of the experience and equipment that the average layman has. Fourteen pesticide disposal procedures are described and procedures for disposal of containers and cleanup and treatment of spills are included. Preferred and alternate disposal procedures are recommended for over 550 pesticides. Included are a cross-index of over 1,600 pesticide names, tables showing the chemical composition and properties pertinent to disposal of the selected pesticides and bibliography of 166 references. (EPA)
W76-01875

TREATMENT AND ULTIMATE DISPOSAL OF CATTLE FEEDLOT WASTES,
Kansas State Univ., Manhattan.
H. L. Manges, R. I. Lipper, L. S. Murphy, W. L. Powers, and L. A. Schmid.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 185, $6.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-013, June 1975. 136 p, 44 fig, 26 tab, 78 ref. 1BB039. S800923.

Descriptors: Anaerobic conditions, *Waste disposal, Water pollution, Cattle, Rainfall, Soil chemistry, Soils, Fertilization, Groundwater, *Ultimate disposal, *Farm wastes, *Feed lots, Great Plains, Environment, *Waste treatment, Kansas.
Identifiers: Water pollutants.

A study was conducted to determine the characteristics of beef feedlot wastes, both runoff and manure, and the optimum application rate of these wastes to land. The project was located at a commercial beef feedlot in southcentral Kansas. Characteristics of beef feedlot wastes varied widely with season. Near maximum corn forage yields, without excessive accumulation of salt in the soil, were obtained from waste application rates necessary to meet nitrogen fertilizer recommendations. At these waste application rates, basic intake rate of water into the soil was increased. Net income from irrigated corn production was sufficient to make application of feedlot manure with disposal as the main objective unprofitable. Land application rates of beef feedlot wastes should be based upon the results of laboratory analyses of wastes from each feedlot. Feedlot wastes should be applied at rates necessary to meet nitrogen fertilizer recommendations. A salt-alkali test should be made annually on the surface soil to monitor changes in soil salinity levels. (EPA)
W76-01876

CONTROLLING SULFIDES IN SANITARY SEWERS USING AIR AND OXYGEN,
For primary bibliographic entry see Field 5G.
W76-01877

WATER QUALITY STANDARDS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PRODUCTIVE BUT UNREALISTIC,
For primary bibliographic entry see Field 5G.
W76-01959

5E. Ultimate Disposal Of Wastes

WASTE CONVERTER,
Standard Products Co., Cleveland, Ohio. (assignee).
H. W. Green, and O. F. Cook.
United States Patent 3,906,873. Issued September 23, 1975. Official Gazette of the United States Patent Office, Vol 938, No 4, p 1575, September, 1975. 1 fig.

Descriptors: *Patents, *Waste disposal, *Incineration, *Sewage disposal, Equipment, Waste disposal.

A method of sewage disposal has been patented. Equipment consists of a vaporizing chamber and means for discharging wastes downward into the chamber. Flaming combustion products are in-

troduced into the chamber at a rate sufficient to maintain a flame-filled condition within the chamber. A high proportion of the sewage products are thereby vaporized and consumed. Exhaust means are connected to the upper portion of the chamber, and separation equipment is located in the exhaust means to remove solids from the exhaust. (Kramer-FIRL)
W76-01539

SEWAGE TREATMENT SYSTEM INCLUDING EFFLUENT EVAPORATOR,
Coate Burial Vault, Inc., West Milton, Ohio. (assignee)
For primary bibliographic entry see Field 5D.
W76-01541

CHICAGO'S SYSTEM OF SLUDGE TRANSPORT TO LAND RECLAMATION SITES.
Public Works, Vol 106, No 8, p 72, August, 1975.

Descriptors: *Sludge disposal, *Lagoons, *Treatment facilities, Sludge treatment, Transportation, Recycling, Pumps, Waste water treatment, Illinois.
Identifiers: Land application, *Chicago(Ill).

Sludge removal from waste water treatment plants is being undertaken at two locations in the Chicago area. At the Lawndale Avenue lagoon facility, which serves as the storage area for sludge from the West-Southwest treatment works, sludge removal is handled directly by the Metropolitan Sanitary District of Greater Chicago. At the Calumet treatment works, the operation is being handled by private contractors. At each location, sludge is transferred from the lagoons to bulk carriers by submersible pumps placed directly in the lagoons. Sludge from Lawndale is discharged to barges on the adjacent Chicago Sanitary and Ship Canal, which will deliver it to a Fulton County site about 180 miles away. The dense sludge is moved to the barges by two Flygt CS-3300 pumps; mixers fluidize the sludge so that the concentration is under 8 percent. At the destination in Fulton County, each barge is unloaded by pumps and conveyed 11 miles for storage before land application. Sludge which has been stored in Calumet lagoons from 10 to 20 years is pumped out directly to railroad tank cars, each with a capacity of 20,000 gallons. The solids content of this sludge is more than 12 percent. A special rake blade traverses the lagoon and draws the sludge to the point of pumping at the lagoon edge. Four Flygt B-2250 submersible pumps are supported by a pier near the lagoon edge and hoses discharge to the tank cars through a pipeline 6700 feet long. Trains take the sludge daily to the Shawnee National Forest and to Arcola, Illinois, for disposal as fertilizer and soil conditioner. (Kramer-FIRL)
W76-01544

MIAMI PUSHES REGIONALIZATION TO KEEP PACE WITH POPULATION,
Miami-Dade Water and Sewer Authority, Fla.
For primary bibliographic entry see Field 5D.
W76-01546

SANITARY LANDFILLS: NO PLACE FOR LEACHING,
Richards of Rockford, Ill.
For primary bibliographic entry see Field 5D.
W76-01550

LAND DISPOSAL OF WASTEWATER IN HAWAII,
Hawaii Univ., Honolulu, Dept. of Civil Engineering
G. L. Dugan, R. H. F. Young, S. L. Lau, P. C. Ekern, and P. C. S. Loh.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2067-2087, August, 1975. 4 fig, 8 tab, 11 ref

Descriptors: *Waste disposal, *Irrigation, Drainage, Sugarcane, Grasslands, Nutrient removal, Viruses, Recycling, Effluents, *Hawaii.
Identifiers: *Waste reuse, Land application, Oahu(Hawaii), Enteric viruses, Total organic carbon.

Determination of the feasibility of applying secondary treated waste water effluent to selected land areas on the island of Oahu, Hawaii, is discussed. Grassland and sugarcane culture were irrigated with waste water effluent to ascertain the probable effects on groundwater quality, particularly in terms of dissolved solids and enteric virus transmission and survival. Also, the total sugar cane production and purity were determined for sugar cane cultured in test plots receiving waste water effluent. A combination of grass and soil removed almost all detectable amounts of nitrogen and phosphate from waste water effluent, and between 90 and 95 percent of TOC, suspended solids, and boron. Sugar cane fields showed the same general results. Human enteric viruses were found to have generally surfived secondary waste treatment. However, the soil was effective in removing the viruses from the secondary effluent. (Pinto-FIRL)
W76-01557

THE DEVELOPMENT OF A CENTER PIVOT WASTEWATER IRRIGATION MACHINE,
Metropolitan Sanitary District of Greater Chicago. Ill.
For primary bibliographic entry see Field 5D.
W76-01565

WATER QUALITY ASPECTS OF TANNERY EFFLUENTS DISPOSAL,
National Research Inst. for Shoe and Allied Industries, Gottwaldov (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W76-01645

ENVIRONMENTAL CONSIDERATIONS OF SANITARY LANDFILL SITES: PART I,
Dames and Moore, Los Angeles, Calif.
J. A. Fischer, and D. L. Woodford.
Public Works, Vol 104, No 6, p 93-97, 1973, 4 fig, 2 tab.

Descriptors: *Sites, *Landfills, Sanitary engineering, Geology, Environmental effects, Groundwater, Leachate, Hydrology, Biochemical oxygen demand, Chemical oxygen demand, Chlorides, Nitrates, Impervious soils, Topography, Climates, Rock properties, Aesthetics.

Proper selection of sanitary landfill sites should include knowledge of the mechanism of fill decomposition, the hydrologic cycle, geology, and ecological balances. Pollution of groundwater by leachate is probably the most important problem; the significant pollutants are usually biochemical oxygen demand, chemical oxygen demand, chloride, and nitrate. Site topography and soil conditions may cause erosion problems. Air pollution, control of disease vectors, possible disturbance of the ecological balance, noise, odors, and appearances must all be considered. Site selection should include evaluation of the type, elevation, and quality of the soil and rock; water levels; ground-and surface- water systems; and local occurrences and uses of water resources. Excellent sites should provide natural protection against pollution: thick deposits of relatively impermeable materials under the site, adequate quantity and quality of cover material, and favorable topographic, hydrologic and climatological features. Avaliable information about these factors should be reviewed, then borings made at the site to confirm these conditions. Piezometers should be installed during drilling operations to monitor water quality and flow conditions. (Buchanan-Davidson--Wisconsin)
W76-01649

PROCESS FOR TREATING SEWAGE SLUDG
For primary bibliographic entry see Field 5D
W76-01730

SAND FILTER AND WASTE STABILIZATI POND TEST SHOWS POSSIBILITY F TREATMENT OF INDIVIDUAL WASTEWAT DISPOSAL,
Public Health Service, Grant, N. Mex. Div of dian Health.
For primary bibliographic entry see Field 5D.
W76-01738

THE USE OF WASTE HEAT IN A SYSTEM F ANIMAL WASTE CONVERSION WITH I PRODUCT RECOVERY AND RECYCLING,
Oregon State Univ., Corvallis. Dept of S Science.
For primary bibliographic entry see Field 5D.
W76-01806

DISPOSAL OF MARINE SEWAGE: AN I VIRONMENTAL MANAGEMENT STANDA FOR NAVAL SHIPS,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5G.
W76-01828

GUIDELINES FOR THE DISPOSAL OF SMA QUANTITIES OF UNUSED PESTICIDES,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-01875

TREATMENT AND ULTIMATE DISPOSAL CATTLE FEEDLOT WASTES,
Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 5D.
W76-01876

TEST CASE ON OCEAN DUMPING: MU PHILADELPHIA MOVE TOWARD ON-LA DISPOSAL OF SEWAGE SLUDGE.
For primary bibliographic entry see Field 5G.
W76-01971

MARINE POLLUTION-PREVENTION-WAST ETC.
For primary bibliographic entry see Field 6E.
W76-01992

5F. Water Treatment and Quality Alteration

OPTIMAL PLANNING OF REGIONAL WAS WATER SYSTEMS AND THEIR IMPACTS STREAM QUALITY WITH A CASE STUDY THE CARSON RIVER BASIN,
Nevada Univ., Reno. Dept. of Civil Engineering
R. G. Orcutt, L. D. Bottoroff, and T. D. Chiatovich.
Available from the National Technical Inform tion Service, Springfield, Va 22161, as PB-247 0 $6.75 in paper copy, $2.25 in microfiche. Des Research Institute, Reno, Center for Wa Resources Research, Publication No EN-2, A gust 1975. 148 p, 14 fig, 10 tab, 71 ref, 4 appe OWRT B-061-NEV(1). 14-31-0001-3909.

Descriptors: *Model studies, *Waste water tre ment, *Nevada, *Optimum development pla *Regional analysis, Algorithms, Treatment fac ties, River basin development.
Identifiers: Lake Tahoe, *Carson Ri Basin(Nev).

The problem of wastewater transportation, tre ment, and utilization in the Carson River and L Tahoe Basins served as a basis for the devel

of the methodologies presented. A general stic algorithm for determining near optimal nal wastewater facilities was derived. mic programming was employed for the sub- ization of interlinked wastewater transporta- systems. The diurnal variation of dissolved en due to photosynthesis was modeled. A ssion relationship involvnig nutrients, flow, temperature was used to estimate the mag- e of the photosynthesis component of the el. Possible future population growth patterns e Carson Valley and the Nevada portion of Tahoe were analyzed with the algorithm to mine the near optimal wastewater facilities to them. The impacts of these systems on dis- d oxygen levels in the Carson River were as- d with the simulation model. Sensitivity anal- of significant parameters was performed to ve a better understanding of their sig- nce in achieving a solution to the type of lem under consideration. (Fallon-Nevada) -01524

OTARY APPARATUS FOR PURIFYING WATER BY ALTERNATELY CONTACT- THE SURFACE OF THE APPARATUS H AIR AND WATER,
. Ahlgren.
ralian Patent 463,591. Issued July 31, 1975. cial Journal of Patents, Trade Marks and gns, Vol 45, No 27, p 3046, July, 1975.

riptors: *Water purification, *Water treat- , *Patents, Equipment, Aeration.
tifiers: Rotary systems.

ry water treatment equipment has been nted. The system is closed except for entrance exit openings, and includes means fro causing apparatus to rotate. Contact surfaces for air water are provided witnin the body of the ap- tus, and are arranged so that water is ad- ed through the body and is purified. The ro- body has a buoyancy of its own and will e, supported by the water, and automatically st itself to the water level. (Kramer-FIRL) -01538

LUORIDATION OF WATER BY NALGON- TECHNIQUE,
onal Environmental Engineering Research , Nagpur (India).
. Nawlakhe, D. N. Kulkarni, B. N. Pathak, K. R. Bulusu.
an Journal of Environmental Health, Vol 17, , p 26-65, January, 1975. 8 fig, 22 tab, 21 ref.

riptors: *Potable water, *Water treatment, orides, Pilot plants, Laboratory tests, Analyti- echniques, Operating costs, Economics.
tifiers: *Defluoridation, *India, *Chemical tment, *Nalgonda technique.

echnique to remove excess fluorides from king water has been developed in India. The posed method, called the 'Nalgonda hnique', consists of the addition in sequence of um aluminate or lime, bleaching powder and r alum to the fluoride water, followed by floc- tion, sedimentation, and filtration. The hod was investigated under laboratory condi- s and then tested in the field. Such field studies uded experiments in buckets and in drums ch type) as well as in pilot plants (continuous). The technique was seen to be effective in lucing a clear water, with fluoride within per- sible limits. The precise mechanism of fluoride oval was not understood, and it was due her to adsorption nor to coprecipitation. The nique is adaptable to community water sup- s, and the costs for defluoridation of water for viduals or communities is low enough so as to easible. (Kramer-FIRL) 5-01543

PROGRESS WITH THE DECARBONIZATION PROCESSES (FORTSCHRITTE IN DER VERFAHRENSTECHNIK DER ENTCARBONISIERUNG),
R. Flunkert, H. Pietzner, and A. Schiffers.
Vom Wasser, Vol 43, p 467-494, 1974. 20 fig, 2 tab, 10 ref.

Descriptors: *Calcium carbonate, *Water treatment, Potable water, Water softening, Equipment, Efficiency, Industrial water.
Identifiers: *Decarbonization.

Advances in chemical and engineering technology have permitted the optimization of rapid decarbonization reactors. Practical experience with full-scale trials have confirmed the results of laboratory studies. Several interesting solutions, in terms of economics, have been identified. Rapid decarbonization is sometimes difficult to achieve. This has an adverse effect on optimum operation of the processes because of the sludgy characteristics of the precipitated carbonate of calcium. Mineralogic research has shown that the crystalline structure of calcium carbonate is very important. It is concluded that there are limits to large-scale rapid decarbonization. (Orr-FIRL)
W76-01545

THE CONSTANCE DRINKING WATER TREATMENT STATION-MODEL STUDIES AND OPERATING EXPERIENCES (DIE KONSTANZER TRINKWASSERAUFBEREITUNG-MODELLUNTERSUCHUNGEN UND BETRIEBSERFAHRUNGEN),
R. Barth, H. Lehn, and J. Mauz.
Vom Wasser, Vol 43, p 117-125, 1974. 4 fig, 2 tab, 6 ref.

Descriptors: *Water treatment, *Water purification, *Filtration, *Ozone, Filters, Foreign research, Potable water, Water supply, Europe.
Identifiers: Microfilters, Sand filters, Lake of Constance.

A new system for potable water purification was necessitated by the increasing amount of plankton in the depth of 40-50 meters of the Lake of Constance. The system consists of a rotating microfilter, the addition of unpressurized ozone, and a sand filter. The rate of filtration is 10 m/hr. This system was effective in laboratory tests performed from 1964 to 1966 and in a plant situation from 1968. A tissue of steel-threads, containing 230 holes per sq mm, is stretched over the microfilter. The holes form triangles, and within each triangle is a circle with a 23 mm radius. The zooplankton, most of the phytoplankton, and some bacteria are caught by the tissue. Two percent of the purified water is used to rinse the microfilter. This rinsing brings 90% of the raw-mass into the sewage canal. The remaining small plankton and bacteris are oxidized by ozone. The sand filter can be operated for long periods without cleaning. Cleaning uses 3.0% of the purified water and is performed about every six weeks. The small amount of purified water required for rinsing the microfilter and sand filter eliminates a large drain on the water supply. (Orr-FIRL)
W76-01547

EXPERIENCES WITH DRY FILTRATION OF WATER IN THE NORTH GERMAN LOW LAND (ERFAHRUNGEN MIT DER TROCKENFILTRATION VOL WAESSERN DER NORDDEUTSCHEN TIEFEBEBE),
H. W. Braeuer.
Vom Wasser, Vol 43, p 237-245, 1974. 4 fig, 1 ref.

Descriptors: *Filtration, *Water Treatment, *Filters, Water works, Pilot plants, Foreign research, Efficiencies.
Identifiers: *Dry filters, *Germany.

Dry filtration is described and the raw water supply in Northern Germany is characterized. Operating experiences with dry filters used in 7 water works and 14 pilot plants are discussed. The high solids-holding capacity, and the efficient filtration that can be achieved by employing dry filtration is demonstrated. The performance of these filters after backwashing, and the various operational applications are also discussed. (Orr-FIRL)
W76-01548

BIN ACTIVATOR HELPS UPGRADE WATER PURIFICATION OPERATION.
Water and Sewage Works, Vol 122, No 8, p 68, August, 1975. 1 fig.

Descriptors: *Water treatment, *Lime, *Equipment, Automation, Water purification, Mechanical equipment, Installation, Flow.
Identifiers: Vibra Screw Bin Activator.

An automated system designed to discharge pebble lime from storage to a 10 mgd water purification process was installed in 1974 in the Kankakee Water Company's plant in Kankakee, Illinois. The automated system has reduced labor costs, provided additional storage space in the chemical building, and upgraded the general cleanliness of the facility. The system used pebble lime stored in a wide bin, remote from the chemical building. A five foot Vibra Screw Bin Activator was installed on the storage bin to ensure successful operation of the new system and to eliminate bridging and packing. The bin activator is a vibrated bin bottom, replacing the converging bottom of a static bin, therby removing the compacting area. The bin activator is flexibly attached by rubber fitted forged steel hangers and a bolted seal ring assembly to the enlarged opening formed by cutting off the bin bottom. Bin activator vibrations are isolated from the bin itself by the hangers. The ring assembly facilitates installation and eliminates field fitting and welding. An oil-lubricated and cooled Gyrator vibrates the bin activator and the material in the bin, while an intergral vibrated baffle relieves the headload and transfers the vibrations to material far up in the bin. The material in the activator is thrown horizontally toward the discharge outlet, producing a constant flow of material. (Orr-FIRL)
W76-01549

POLYELECTROLYTES FOR POTABLE WATER TREATMENT.
Water Services, Vol 79, p 147-148, April, 1955.

Descriptors: *Polyelectrolytes, *Potable water, *Water treatment, Coagulation, Sludge treatment, Turbidity, Specifications, Sludge, Water quality, Costs.
Identifiers: Monomer acrylamide.

Polyelectrolytes are being used as coagulant aids in treating water for a potable supply. Although polyelectrolytes have not completely replaced inorganic salts as primary coagulants, they have proven effective in removing color and turbidity from natural waters when up to 5 mg/liter of finely divided sodium montmorillonite clay was added to the water first. One of the advantages of using cationic polyelectrolytes as primary coagulants is a reduction in the amount of sludge produced. Another application of polyelectrolytes in the treatment of potable water is conditioning of sludge before dewatering. The addition of polyelectrolytes accelerates the thickening of sludge by sedimentation before final dewatering. Examples are given of the many uses of polyelectrolytes in potable water treatment. The use of polyelectrolytes instead of activated silica has resulted in lower treatment costs and better finished water quality. The toxic monomer acrylamide is used in the manufacture of some polyelectrolytes. These polyelectrolytes must meet the following specifications established by the U.S. Food and Drug Administration, the U.K. Department of

the Environment, and similar agencies in other countries: no batch may contain more than 0.05 percent monomer acrylamide; the amount used must average no more than 0.5 mg/liter and never exceed 1.0 mg/liter; and, an upper limit for the content of monomer acrylamide must be stated by the supplier for every batch. (Dean-FIRL)
W76-01551

ACTIVATED CARBON FIGHTS BAD TASTE,
C. A. Black, and D. J. Sulick.
Water and Wastes Engineering, Vol 12, No 9, p 70, 72, 74, September, 1975. 3 fig, 2 tab.

Descriptors: *Water treatment, *Activated carbon, *Taste, *Odor, Potable water, Water quality, Filtration, Suspended solids, Organic compounds.
Identifiers: Filtrasorb 200 granular activated carbon.

Granular activated carbon filters have eiliminated taste and odor problems in the potable water supply of Granite City, Illinois. Filtrasorb 200 granular carbon was added to replace the sand in the city's eight filters. The filters were water soaked for one hour and then slowly backwashed to remove carbon fines. After the fines were removed, the backwash rates were increased to 10.5 gpm/sq ft, producing a 40% bed expansion at a minimum water temperature of 35C. The conversion of the sand filters to carbon filters was finished early in February 1971. Daily threshold tests have shown that the activated carbon filters consistently produce an effluent with a threshold odor value of less than one, irrespective of fluctuations in the quality of the raw water supply. Routine analytical tests to determine the exhaustion rate of the carbon show that about one-half of the adsorption capacity of the carbon has been used. Chlorinated hydrocarbons, phenols, pesticides, insedticides, and aromatic compounds are adsorbed by the carbon filters. The filters have also increased the removal of suspended solids while maintaining the filter head loss to a minimum. The lower backwash rate used with the carbon filters as compared to the rate necessary with the sand filters has resulted in a savings of backwash water. (Orr-FIRL)
W76-01553

EXPANDING A 1927 WATER PLANT FOR THE 1970'S,
H. F. Seidel, and J. L. Cleasby.
Public Works, Vol 106, No. 8, p 54-57, August, 1975. 4 fig.

Descriptors: *Water treatment, Hardness(Water), Filtration, Treatment facilities, Construction, Iowa.
Identifiers: Ames(Iowa), Lime-soda ash softening.

The development of the present Ames, Iowa, water treatment plant is discussed. In 1932, construction began on a new softening plant, to replace the small system that had evolved up to that time. A leading expert on softening was consulted and a plant with a two stage softening process, using lime and soda ash in one stage, and recombining sludge as a seeder for the second stage was constructed. In the 1950's, single stage treatment was experimented with to increase hydraulic capacity. In 1962, this single stage plan was implemented. The latest changes were made in 1971. Over the years a highly flexible, responsive modern treatment plant has been developed, with a minimum of gadgetry and automatic controls and thus a minimum of control and equipment maintenance. (Pinto-FIRL)
W76-01558

WHAT'S NEW IN WATER TREATMENT.
V. Fairweather
Civil Engineering--ASCE, Vol 45, No 9, p 69-72, September, 1975. 2 fig, 2 tab.

Descriptors: *Water treatment, *Potable water, *Legislation, *Chlorine, Ozone, Activated carbon, Polymers, Coagulation, Filtration, Costs, Public health, Turbidity, Water quality standards.
Identifiers: Carbon Chloroform Extract, Safe Drinking Water Act, Carcinogens.

Various assessments of existing standards for potable water were reviewed, partially due to the discovery of potential carcinogens in the New Orleans, Louisiana, water. The largest controversy was on the use of chlorine both at the waste water treatment plant and at the water treatment facility, which may combine with trace organics to form the potential cancer-causing compounds. The two alternatives appeared to be the removal of all possible organics or the elimination of chlorine treatment. Removal of organics by ozone or by activated carbon treatment have been considered. Two proposed standards under discussion were the stringent turbidity standard (1.0 TU) and the Carbon Chloroform Extract (CCE) standard (0.7 mg/liter). The CCE test, which reveals the presence of organic compounds absorbed by carbon, has been criticized as being too broad to be meaningful. It is possible for a water supply to have a high CCE and not contain any carcinogens; it also feared that a water supply with low CCE may contain carcinogenic matter. Other issues under discussion included the advantages of polymer use over alum as a coagulant; the advantages and disadvantages of direct filtration; and the recovery and reuse of alum in sludge disposal. With the implementation of the Safe Drinking Water Act last year, costs of public health will be more carefully considered in the meeting of final standards. (Kramer-FIRL)
W76-01561

THE PREPARATION AND OXIDATIVE PROPERTIES OF FERRATE ION (FEO42-) STUDIES DIRECTED TOWARD ITS USE AS A WATER PURFYING AGENT, PHASE II,
Missouri Univ., Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W76-01687

WATER PURIFICATION DEVICE,
Gartner Research and Development Co., Bartlett, Ill. (assignee)
W. J. Gartner.
U.S. Patent No 3,909,402, 4 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 938, No 5, p 2394, September 30, 1975.

Descriptors: *Water treatment, *Patents, *Water purification, *Filtration, *Adsorption, Water pressure, Activated carbon, Ion exchange, Resins, Equipment.

A system is provided in which the water to be purified flows through a vertical, elongated adsorbent-containing cartridge in an upward direction and is forced through the cartridge against the back pressure of a fine filter downstream of the adsorbent to provide a pressure within the adsorbent chamber between about 5 and 20 psig. The granular adsorbent comprises activated carbon for the purification of waters containing gases, or materials causing odors or colors. The granular material is an ion exchange resin, or a mixture of cationic and anionic exchange resins for the demineralization of water. In use, the purification device is placed in upright position near a source of tap water which is controllable with respect to pressure and rate of flow. The tap water source is connected to the inlet by a connection capable of withstanding moderate pressures; and the outlet of the device is arranged to lead to a receptacle for the purified water. (Sinha-OEIS)
W76-01725

CLARIFYING AGENTS FOR WATER,
For primary bibliographic entry see Field 5D.
W76-01727

ALUMINUM AND WATER TREATMENT. 'GULDAGER' ELECTROLYTIC PRO (L'ALUMINUM ET LE TRAITMENT EAUX. LE PROCEDE ELECTROLYT 'GULDAGER'),
H Schaefli, and R Grossenbacher.
Revue Suisse de l Aluminium, No 5, p 12 May, 1975. 7 fig.

Descriptors: *Corrosion control, *Water ment, Equipment, *Aluminum, Tanks, trolytes, Cathodic protection.
Identifiers: *Guldager process.

The 'Guldager' electrolytic system develope corrosion and scaling prevention is described tank on the installation to be protected is pro with a pure aluminum plate serving as an connected to a d.c. source, while the tank p serves as a cathode connected with the ne pole of the d.c. source. The rectifier voltag plied is between 10 and 25 Volts, and the c density varies from 100 to 400 mA/sq cm as a tion of the water composition. The d.c. c flowing through the water counteracts the sion current; therefore, the tanks and heatin faces are cathodically protected. The pipelin protected against corrosion due to the alum anodes emitting colloidal aluminum hydr which forms protective layers in thicknesses 1-2 mm. Calcium carbonate scaling is prevent the aluminum hydroxide particles encapsu the carbonate particles. The carbonate coate aluminum hydroxide settles on the tank botto easy removal. (Takacs-FIRL)
W76-01736

OZONE DEGRADATION IN PA COLUMNS,
Rice Univ., Houston, Tex. Dept. of Enviro tal Science and Engineering.
For primary bibliographic entry see Field 5D.
W76-01743

DEVELOPMENTS IN BACKWASHING GRANULAR FILTERS,
Iowa State Univ., Ames. Dept. of Civil Eng ing; and Iowa State Univ., Ames. Engin Research Inst.
For primary bibliographic entry see Field 5D.
W76-01745

ASBESTOS AND CHLORINATED ORGA TOP AWWA DISCUSSIONS,
W. J. Storck.
Water and Wastes Engineering, Vol 12, No 8 28, August, 1975.

Descriptors: *Asbestos, Potable water, * water treatment, *Water treatment, Water su Water reuse, Public health, Chlorination, O wastes, Colorado.
Identifiers: *Chlorinated organics, Denver(C

Discussion of contaminants in waste wate drinking water was presented at the annual ference of the American Water Works As tion. The focus was asbestos in potable wate plies and chlorinated organics in discharge fluents. A water treatment plant has been des to remove asbestos fibers and lower turbid Duluth, Minnesota. The 30 mgd system consi coagulation, flocculation, gravity filtration, water recovery, and sludge storage. The que of chlorinated organics as carcinogenic agent debated, and the need for laboratory res (animal experiments) on the effects of asbestos and chlorine was stressed. Other ference papers focused on reuse of waste The primary example was the Denver, Colo program. The proposed treatment metho Denver's 1.0 mgd demonstration plant consi lime and other chemical coagulants, recar tion, filtration, nitrogen removal by the system and then regeneration using the

process, two stage carbon treatment with between the stages, a demineralization ozonization, and residual disinfection lorine. The importance of the public for this and other proposed projects was d, and it was felt that the public is not opposed to reuse. (Kramer-FIRL)
86

ION OF ECONOMICAL PIPE SIZES ATER DISTRIBUTION NETWORKS,
Cybernetics, Merritt Island, Fla.
nmons.
Vorks, Vol 106, No 9, p 84-85, September, g, 1 tab, 4 ref.

ors: *Water distribution(Applied), *Pipes, ution systems, Piping Mechanical), Costs, Economics, Evaluanputer programs, Analytical techniques.
rs: Pipe size selection, 'Econ 2'.

gh analysis of hydraulic data for a water ion system does not ensure that the most cal pipe size will be chosen. Pipe size is more dependent on economic factors s on hydrodynamic considerations. The nomical pipe sizes are determined by pipe , pipe cost, and pumping cost. For any pe cost schedule, interest rate, flow rate rtization rate, there is a most economical e. Determination of the optimum set of cal pipe sizes for a distribution network is ive process involving the combination of omical diameter calculation with the flow ion analysis. Manual application of this al procedure is very time-consuming, , the use of large high-speed time sharing s the analysis. The 'Econ 2' program has igned to add economical pipe size calcula- an existing software program for the anal- low and pressure distribution, 'Water X'. lication of 'Econ 2' to a small distribution s illustrated by tables showing the system sed upon the originally estimated pipe l the cost analysis after calculation of the cal pipe sizes using 'Econ 2'. Selection of cal pipe sizes can represent a substantial ference. This procedure should be em- hen constructing a new water distribution or expanding an existing system. (Orr-
87

VEMENT OF THE QUALITY OF SUPPLY SOURCES (POLICY STATE- OF AMERICAN WATER WORKS AS- ION).
ary bibliographic entry see Field 6E.
62

AFE DRINKING WATER ACT AND OLE IN TRAINING,
mental Protection Agency, Washington, vision of Water Supply.
ary bibliographic entry see Field 5G.
63

ater Quality Control

IENTATION OF A N. P. D. E. S. DATA EMENT SYSTEM,
t School of Industrial Management. e, Ind.
inston.
e from the National Technical Informarmation Service, Springfield, Va 22161 as 12. $4.00 in paper copy, $2.25 in he. Purdue University Water Resources Center, Technical Report No 69, Sep- 1975, 22 p, 4 fig, 17 ref. OWRT A-040-

Descriptors: *Data processing, *Data storage and retrieval, *Monitoring, Computer models, Water quality standards, Indiana, Pollutant identification, Water pollution control, Information exchange, Information retrieval.
Identifiers: *National pollutant discharge elimination system, Generalized Planning system.

This is a case study of the National Pollutant Discharge Elimination System (N. P. D. E. S.) permit monitoring system specifically with the Indiana Stream Pollution Control Board. This system is concerned with the issuance of permits for polluting the state's waterways, as well as monitoring adherence to these permits. Such efforts necessarily (1) involve the collection, storage, and accession to large volumes of data, (2) and the utilization of models and algorithms that provide the needed analyses of the data. The computer-based data management and retrieval system presented releases the user from the tedious task of data management. The information system provides: (1) an organized structure for data storage; (2) report generation capabilities, and (3) simplified methods for selective information retrieval. The system was designed within the framework of the Generalized Planning System (GPLAN) developed at Purdue University. (Wiersma-Purdue)
W76-01502

WATER QUALITY CONTROL AND BUSINESS BEHAVIOR, WISCONSIN UNIV., MADISON. GRADUATE SCHOOL OF BUSINESS ADMINISTRATIONS,
Wisconsin Univ., Madison. Graduate School of Business Administration.
J. Bilkey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-113. $3.50 in paper copy, $2.25 in microfiche. University of Wisconsin Water Resources Center Technical Report WIS WRC 75-08, 1975. 19 p, 4 tab, 3 ref. OWRT A-052-WIS(1) 14-31-000-5050.

Descriptors: *Water pollution, Costs, Economics, *Decision making, *Feasibility, *Cost comparisons, *Water quality control, *Behavior, Attitudes, *Wisconsin, *Economic impact, Optimization, Surveys, Pollution abatement.

An important problem is how to achieve water quality control with minimal adverse economic impacts. This would seem to be an economic optimality problem involving two issues: ascertaining the optimum point between water quality and economic output, and devising a strategy for working toward that point. The following analysis focuses on the latter issue. It conceives of the adoption of water pollution abatement measures as an entrepreneurial type of problem in which each firm must ascertain how to adopt such measures into their operations and remain viable. Logically, then, anything which facilitates this entrepreneurial type of activity will hasten water pollution abatement. Alternatively, if this entrepreneurial type of activity fails to take place, attempts to force water pollution controls will merely drive firms out of business, with consequent unemployment and real income loss. Preparatory to designing research projects for ascertaining how to facilitate undertaking water quality controls, it seems desirable to examine the process by which firms undertake activities about which a considerable amount of information already exists. Exporting is useful for this purpose. This preparatory analysis involved in-depth interviews with the managers of ten Wisconsin firms regarding water quality control and their operations. For analogical insights a mailed questionnaire survey regarding export behavior was made of 423 small-sized Wisconsin manufacturing firms. Inferences were drawn for the adoption of water quality control measures, and a basis laid for a definitive study of the subject.
W76-01505

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert School of Industrial Administration. Lafayette, Ind.
A. B. Whinston.
Available from the National Technical Information Service Springfield, Va 22161 as PB247-142, $4.50 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center Technical Report No 68, September 1975, 63 p, 17 fig, 12 ref. OWRTA-031-IND(1).

Descriptors: *Data processing, *Decision making, *Planning, *Water quality standards, Basic data collections, Data storage and retrieval, Management, Indiana, Water quality control, Information exchange.
Identifiers: Generalized planning system.

A data management system is presented that will aid planners in the implementation of a decision support system which addresses the technical aspects of areawide water quality planning. The basis is the systematic study of the information flows and their relationships to the goals of the water planning group. The study involved a data processing program for the Technical Information Section of the Indiana Stream Control Board. The data required for the system includes (1) an area description, (2) quality goals, (3) point source data, (4) non-point source data, (5) cost information for the various types of treatments, (6) data on land use plans, populations and employment, and (7) design flow of municipal facilities. The study was an application of the GPLAN (Generalized Planning System) developed at Purdue University. The system is capable of supporting data bases and models for a wide variety of planning problems in addition to water quality management. The GPLAN is a valuable planning tool in that it automates the intertacing between data and models, and it offers a non-procedural, English-like interface between the planner and his computerized resources. (Wiersma-Purdue)
W76-01508

A REVIEW OF STATISTICAL PROCEDURES USED FOR EXAMINATION OF WATER DATA,
Massachusetts Univ., Amherst. School of Health Sciences.
For primary bibliographic entry see Field 7A.
W76-01509

PUBLIC PRIORITIES FOR GREAT LAKES RESEARCH,
Great Lakes Basin Commission, Ann Arbor, Mich.
W. C. Sonzogni, R. W. Reed, and L. T. Crook.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-088, $4.50 in paper copy, $2.25 in microfiche. Completion Report, 1975, 64 p, 1 fig, 30 tab, 9 ref, 5 append. OWRTX-148(NO 4250) (1).

Descriptors: Surveys, Data collections, Planning, Water resources, Planning, Short term planning, Water pollution control, Water quality, Management, Institutions, *Great Lakes, *Research priorities, Social participation, Attitudes.
Identifiers: *Research needs, Public interest groups, Non-point nutrient sources, Public participation, Public opinion.

A questionnaire was developed in order to survey public interest organizations as to the priority they place on Great Lakes research needs as well as to promote public awareness of research needs. The questionnaire consisted of 14 carefully selected research needs which could be rated according to high, medium, or low priority. Space was left on the questionnaire to add to the printed list any additional research needs that were felt to be important. The questionnaire also asked the respondents to rank their top five research needs for the Great Lakes in the order of their individual priority. Seventy percent of the 149 potential respondents

completed and returned the questionnaire, indicating a relatively high degree of success in involving Great Lakes public interest groups in research issues. The respondents included environmental and civic organizations, local planning organizations, and business, agricultural, and professional organizations. The results of this survey tend to indicate that public interest organizations have a strong interest in several research areas, such as pollution from nonpoint sources and methods of public participation in water resources issues.
W76-01515

AMES RESERVOIR ENVIRONMENTAL STUDY, SUMMARY REPORT.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 4A.
W76-01522

READING USAC PROJECT: SEWER AND WATER ACCOUNTS PROCESSING COMPUTER PROGRAM, RELEASE NUMBER ONE, SOFTWARE,
Reading, Pa. USAC Project.
H. George.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 407/5GA, $150.00 in paper copy, $2.25 in microfiche. May 75, 1 reel mag tape USAC-IMIS-RDG-002 HUD/DF-75/001 - Tape recording mode: 9 track, 800 or 1600 bpi; odd parity, EBCDIC; or 7 track, 556 or 800 bpi, odd or even parity, BCD. Documentation available. HUD-H-1212.

Descriptors: *Local governments, *Water supply, *Computer programs, *Pennsylvania, Management, *Sewerage, *Data processing.
Identifiers: *Reading(Penn), USAC project, Integrated municipal information systems, Software, *Urban Information Systems.

This tape contains the USAC Municipal Sewer and Water Accounts Processing (SWAP) Module for the Reading, Pennsylvania, Integrated Municipal Information System (IMIS). This Module maintains records for 29,000 water and sewer customers, post meter readings and calculate periodic consumption, produce water and sewer bills, post bill payments, and provide reports to the users of the system. There are 11 programs recorded on the tape. 32K bytes of core storage and 32M bytes of disk storage are needed to operate this module on a UNIVAC Model 9300 II computer. . .Technical documentation describing this Module includes: USAC-RPA2-3241, Design Specifications for the Sewer and Water accounts processing Module; USAC-RPA2-4041, Program Specification for the Sewer and Water Accounts processing Module User's Manual. . .Software Description: These programs are written in COBOL for implementation on a UNIVAC Model 9300 II computer using the UNIVAC 0S500 NCOS Rev. 4 operating system. The Data Base Management System is the Reading DMT Version 1, Release 1, Level 1.
W76-01527

INDUSTRIAL POLLUTION OF THE LOWER MISSISSIPPI RIVER IN LOUISIANA.
Environmental Protection Agency, Dallas, Tex. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-01532

HIGH-PRESSURE WATER JET CLEANING OF SUBSURFACE DRAINS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 8C.
W76-01564

LOW PRESSURE JET CLEANING OF PLASTIC DRAINS IN SANDY SOIL,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 8B.
W76-01569

A WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY BASIN, PART 1.
Public Works, Vol. 105, No 5, P. 80-86, May, 1975, 4 fig, 1 tab.

Descriptors: *Water quality control, *Planning, *Water resources planning, *Water quality standards, *Projections, Watersheds(Basins), River basins, Land use, Management, *California, Bays.
Identifiers: *San Francisco Bay(Calif), Porter-Cologne Act(Calif), Effluent limits.

This is an example of basin-wide management demanded by state and federal funding. Plans had to meet Environmental Protection Agency and California's Porter-Cologne Act requirements and had to delineate water quality objectives to establish waste discharge requirements regionally. This basin system includes 80 separate drainage basins occupying 3465 square miles, the largest seven basins accounting for 58% of the area. Studies included population projections, land use potential, economic development, and water use development. Water demand is anticipated to be 1.5 million acre feet per year by the year 2000 whereas projected resources are 1.75 million acre feet per year by 1984. Quality of water could vary depending on sources of supply and consumption patterns. Water quality objectives, including 20 categories of use, were identified after desirable uses of water were established. 'Objectives' is used here to indicate a formal standard toward which control efforts are directed and include thermal provisions, pH, dissolved oxygen, turbidity, sulfide, coliform organism concentrations, ammonia, chloride, and total dissolved oxygen. Other considerations were levels of biotic growth, detrimental deposits, floatables, color, odor, taste, fish flesh tainting, radioactivity, toxicity, pesticide contributions, livestock watering, and domestic uses. Waste load projections to the year 2000 were generated for point and other sources. In addition EPA requirements were complied with by classifying and ranking basin waters according to severity of pollution so that more adverse conditions could receive priority funding. (See also W76-01594) (Smith-North Carolina)
W76-01593

A WATER QUALITY CONTROL PLAN FOR SAN FRANCISCO BAY BASIN, PART 2.
Public Works, Vol 105, No 6, p 75-80, June, 1975. 2 fig, 1 tab.

Descriptors: *Water quality control, *Planning, *Water resources planning, *Alternative planning, *Water reuse, *Environmental effects, *Wastewater treatment, River basins, Watershed management, Evaluation, *California, Treatment facilities, Bays.
Identifiers: *San Francisco Bay(Calif), Facilities requirements, Effluent limits.

To arrive at a plan for this basin, consideration of a number of planning concepts and basin-wide environmental issues was necessary as well as the development of several planning strategies. Key issues were: (1) the use of advanced treatment versus the use of superior dilution-assimilation to low risk zones; (2) regional vs. local treatment facilities; (3) reuse of wastewaters for agricultural and industrial uses, groundwater recharge and streamflow augmentation; and (4) flexibility in timing and placement of facilities to be determined by population growth. Five planning strategies were selected for analysis as follows: (1) the existing plan, a subregional composite; (2) limited consolidation of existing facilities; (3) consolidation of facilities toward areas of potential wastewater reuse or land application with discharge of plan effluc receiving waters in those areas. (4) region solidation of facilitie. with discharge awa sensitive areas. (5) regional consolidatio discharge to areas of greatest assimilative ty. It was concluded that continued dischar San Francisco Bay with upgrading of tre was best. The degree of regionalization of t strategy (the existing plan) was deemed terms of probable environmental enhan and long-term reliability, though this m more expensive than other alternatives. T includes a description of necessary was facilities, non-point control measures, an tional control actions necessary for imple tion. The plan was thought to be superior b it intrudes less into environmentally s areas than other alternatives though some impacts are likely. (See also W76-01593) North Carolina)
W76-01594

MANAGING THE ENVIRONMENT,
Environmental Protection Agency, Wash D.C.
For primary bibliographic entry see Field 6
W76-01597

ECONOMIC IMPACT OF RECENT ENV MENTAL LEGISLATION,
Water and Wastewater Equipment Manufa Association, Chicago, Ill.
For primary bibliographic entry see Field 6
W76-01610

HENRY GEORGE, PROPERTY RIGHT ENVIRONMENTAL QUALITY: CLAS ANSWERS TO 'NEW' PROBLEMS,
Clemson Univ., S.C.
B. Yandle, and A. H. Barnett.
American Journal of Economics and So Vol 33, No 4, p 393-400, 1974. 27 ref.

Descriptors: *Water quality, *Water *Resources allocation, *Welfare(Econ Aesthetics, Pollution taxes(Charges), value, Ethics.
Identifiers: *Usufructure, *Property rights

Henry George's theory of property right plied to environmental quality, and particu water quality and its allocation. In order to a resource efficiently it is only necessary t tain characteristics of the resource be assig system of property rights, specifically in stance, the usufructure. Following this ide tion water quality can then be allocated as for charges for use, both by consumers an ters, as suggested and detailed by J. H. Da sentially, the use of the natural resource c distributed optimally among competing us all monopoly rent held by existing appropri water quality would be extracted. The eth plication that resources are a part of wealth--that each member of society has s herent claim to them, carries with it a spe plication when allocative systems for dist those resources are considered. If a grou vironmental quality consumers were asked mit their bids for marginal units of water and if they were told that each would pay quality obtained and be reimbursed for which they were outbid, the bids would te honest and the resource would tend to be a efficiently. (Auen-Wisconsin)
W76-01614

APPLICATION OF MULTIGOAL QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial A tration, Lafayette, Ind.
D. E. Pingry, and A. B. Whinston.
Journal of the Environmental D Proceedings of American Society of C

ers, Vol 100, No EE1, p 61-75, 1974. 7 tab, 8

criptors: *Water pollution control, *Model stu-
, *Multiple purpose, Planning, Decision mak-
Indiana, Dissolved oxygen, Thermal pollu-
Algorithms, Resource allocation, Optimiza-
Linear programming.
tifiers: West Fork White River(Ind).

nceptual framework for applying optimization
lation techniques in water pollution manage-
t in a river basin is presented. The model is
d on four different sets of dissolved oxygen
ity goals and their annual costs for the West
River, Indiana, and an additional goal in
cing thermal effluents, both relatively inde-
lent in this river application, i.e., if the thermal
ution problem was rejected and the least cost
tion of the BOD problem was determined, the
ctures built and the treatment levels deter-
ed would be the same costs as those in reduc-
hermal pollution. The goals were chosen to il-
ate the possible economies which might be ob-
ed by moderating quality goals downstream
a major pollution source and stiffening the
ity goals upstream. The model provides infor-
on on externalities to be considered in this
urce allocation as applicable to affected con-
ing interests. The planning process would con-
e until an 'acceptable allocation' is reached.
speed of convergence to a solution would be
endent on the type of decision rule used. This
oach indicates that the possibility exists for
mous quality gains at much lower cost than
ld be incurred under treatment at the source
imposition of uniform standards. (Auen-
consin)
-01616

ATIONALE FOR A CORPORATE AIR POL-
ION ABATEMENT POLICY,
fornia Univ., Riverside.
. Ferrar.
erican Journal of Economics and Sociology,
33, No 3, p 233-236, 1974. 4 ref.

criptors: *Pollution abatement, *Air pollution,
lustries, *Social aspects, Return(Monetary),
nomic justification, Labor supply.
tifiers: Corporate support.

tionale for corporate support of regional air
ution abatement is offered based on the basic
it incentive. It is propounded that air pollution
rol expenditures will accrue over future
ods in a fashion difficult to quantify, but sig-
ant. The specific social policy of air pollution
rol is examined with the view of eoconomic
fication through a simple theoretical construc-
manifesting an air-quality related labor market
ping that imposes a real cost burden on the
ness sector. Because a business community
not function by labor quantity alone, but
ires a technically specialized mix undesirable
quality would induce the more educated, spe-
zed labor force to leave the area. Thus it
ld be the qualitative warping of the regional
r supply in response to air quality deteriora-
that would impose a real impact on the cor-
te return. (Auen-Wisconsin)
-01619

ERGY--ENVIRONMENT.
inger Publishing Co., Cambridge, Mass.
primary bibliographic entry see Field 6B.
-01620

E ECONOMICS OF THE WEST COAST OIL
L CLEAN-UP INDUSTRY,
al Postgraduate School, Monterey, Calif.
. Stone.
ilable from the National Technical Informa-
Service, Springfield, Va 22161, as AD-A-003
$4.50 in paper copy, $2.25 in microfiche. MS thesis, December 1974. 78 p, 5 fig, 6 tab, 14 ref, 2 append.

Descriptors: *Oil spills, *Industries, *Water pollution control, Pacific Coast region, Pollution abatement, Return(Monetary), Financial feasibility, Risks, Fluctuations, Elasticity of demand.
Identifiers: *Oil spills clean-up industry, Seattle(Wash), Portland(Ore), San Francisco Bay(Calif), Los Angeles(Calif), Long Beach(Calif), San Diego(Calif).

The effects of the great fluctuations in demand for commerical firms in oil spill clean-up on the West Coast as related to their return on investment and profits; that industry's viability as affected by clean-up service provided by the private sector, the non-profit cooperative sector, and the government sector; and the overlap of the various sectors is discussed. The interaction of equipment and personnel of the complimentary sectors strengthen the need for each sector of the industry. Commerical firms have concentrated their clean-up capability towards minor spills due to the high cost of large-scale equipment required on moderate and major spills, but they contribute to large-scale clean-up incidents within limits of their capability. The impact of demand uncertainty for the commerical firms is mitigated by the extent of their dependence on clean-up activity as a source of revenue or whether the firm is oriented to other services. The study indicated a trend for increased dependence on other than clean-up activities (marine-industrial cleaning services, tug and barge service, and pollution prevention) by most of these firms. The nine firms investigated shared a 2.4 million dollar per year industry but the uncertain nature of clean-up prevents any prediction of potential growth. (Auen-Wisconsin)
W76-01624

STATE OF THE ART--ACID MINE DRAINAGE CONTROL,
Consolidated Coal Co., Library, Pa.
J. L. Lombardo.
Presented at the American Mining Congress Convention, September 9-12, 1973. Denver, Colo. 25 p, 7 fig, 6 tab.

Descriptors: *Acid mine water, *Mine drainage, *Treatment, *Control, Lime, Treatment facilities, West Virginia, Ohio, Pennsylvania, Sludge disposal, Costs, Gypsum, Fouling, *Reviews.
Identifiers: Consolidated Coal Co Library(Pa), Case studies.

Most active mine discharges are alkaline, containing little or no iron; some are alkaline or nearly alkaline and contain iron. True acid mine drainage has low pH and contains large amounts of iron and other metals. The last two types require treatment and lime is the method of choice. Three Consolidated Coal Company treatment plants are described. Water at the Mingo Plant is mildly acid, at the McMurray Plant it is less acid, has a higher iron level, and contains bicarbonates which could cause sludge settling problems; and at the Whetstone plant water quality is poor with large amounts of acidity, iron, aluminum, and sulfates. Total treatment costs vary from $150,000-200,000/year. Major cost items are lime ($12,000-64,000/year) and capital recovery ($22,000-29.000/year). Costs per 1000 gal are 30 cents at Mingo, 13 cents at McMurray, and 72 cents at Whetstone. The problem of poor settling after aeration was solved by eliminating aeration and making the pH higher to remove iron as ferrous hydroxide. Yearly cleaning of sludge settling zones is provided. Removal of sulfate as the precipitates of calcium sulfate or gypsum improves water quality but increases maintenance and equipment costs and reduces plant design options. (Buchanan-Davidson--Wisconsin)
W76-01625

INTERCEPTING TRENCH AT A LANDFILL RENDERS LEACHATE INTO DRINKABLE SOURCE OF WATER,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
J. R. Anderson, and J. N. Dornbush.
Solid Wastes Management/RRJ, Vol 15, No 1, p 60-62, 64, 66 and 68, 1975. 1 fig, 1 tab.

Descriptors: *Water pollution, *Quarries, *Landfills, *Groundwater, Garbage dumps, Public health, Trenches, Leachate, Potable water, South Dakota, Ponds, On-site tests, Interception, Water pollution control, Waste dilution, Alteration of flow, Burning.
Identifiers: *Brookings(SD).

Groundwater quality as affected by a refuse landfill in a gravel pit that penetrates a high water table was studied at Brookings, South Dakota. Groundwater showed an increase in dissolved minerals. An algae-laden pond downstream received groundwater from the fill area and helped reduce hardness and alkalinity during the summer. Degraded water was confined to a zone paralleling the direction of groundwater flow where specific conductance and total hardness were twice that of native water; sodium and chloride concentrations were increased 6- and 15-fold, respectively; only manganese was higher than the recommended limit for drinking water. Water quality improved downstream sufficiently for use as a domestic water supply or irrigation. A trench built downstream to the water table slope intercepted degraded water and treated it by dispersion, dilution, or algal photosynthesis, causing organic groundwater contaminants near the fill to decrease. Refuse should not be deposited in open ponds or places that will be immersed when the groundwater table rises. Burning should be avoided. Excellent drainage should prevent infiltration from reaching the refuse. Using tighter soils for the final earth layer and compaction would reduce leaching. (Buchanan-Davidson--Wisconsin)
W76-01627

CASE HISTORY ON ACID MINE DRAINAGE CONTROL,
Bethlehem Steel Corp., Pa.
F. M. Temmel.
Presented at the American Mining Congress Convention, September 9-12, 1973. 29 p, 10 fig, 1 tab.

Descriptors: *Acid mine water, Treatment, Technology, Acidic water, Lime, Neutralization, Underground waste disposal, Treatment facilities, Pennsylvania, Sludge disposal, Pilot plants, Costs.
Identifiers: Case studies, High-Density Sludge Process, Settled solids.

Methods for treating acidic waste waters from coal-mining operations and from steel plants were evaluated. Lime neutralization and assimilation in a coal-cleaning circuit was used to treat acid mine drainage from a high-volatile coal seam but not from a low-volatile coal seam. Dewatering of sludge is a critical limitation. A modified lime neutralization process produced high-density sludge. Depending on mine-water iron oxidation state, sludges contained 15-40% solids. Higher sludge concentrations make filtering or contrifugation possible. When the total iron ferrous content was above 70%, sludge density increased. With both ferrous and ferric wastewaters, the optimum range of the ratio of recirculated solids to solids precipitated from acid mine-water by neutralization was 25:1 to 30:1. Optimum pH was 7.2-7.7. A one minute detention time produced maximum density sludges; ten minutes ensured ferrous iron oxidation and precipitation at pHs above 7.2. Mine-water aeration before neutralization reduced lime demand. Underground sludge disposal induced further dewatering. The High-Density Sludge Process was effective for acid mine drainage treatment and was applied to mine-water discharges at the Bethlehem Mines Cambria Divi-

sion to treat 3 mgd acid rinsewaters from continuous stripndescaling lines. Plans are being made to treat 2 mgd acid wastewater from a wire-mill descaling operation by this method. (Buchanan-Davidson--Wisconsin)
W76-01650

SOME NEW APPROACHES TO SOLVING URGENT PROBLEMS IN THE THEORY AND PRACTICE OF HYGIENIC STANDARDS FOR INJURIOUS SUBSTANCES ,
M. A. Pinigin.
Available from the National Technical Information Service, Springfield. Va 22161 as PB220-229, $3.50 in paper copy, $2.25 in microfiche. National Institutes of Health Translation. NIH-73-235, May 1973. 6 fig, 29 ref, Translated from Vestnik Akademii Meditsinskikh Nauk SSSR, Vol 27, No 1, p 82-86, 1972.

Descriptors: *Air pollution effects, *Chemicals, *Epidemiology, Standards, Lethal limit, Absorption, Public health.
Identifiers: *Toxicology, USSR, Permissible uptake.

Laboratory tests were conducted on white rats to determine the toxicity of inhalation of chemical substances, dependent on dose-time, as a basis for developing standards of chemical emissions in the USSR as well as evaluation of intermittent effects of chemical pollutants in the environment, which fluctuate considerably over time. The determination of permissible concentrations were also based on biological modification of absorbed chemical pollutants. The experimental data showed that during uniterrupted inhalation the time of the onset of certain toxic effects in animals increases with reduction of the concentration of the substance. The concentration-time dependency curves have a characteristic form for each substance. Acute toxicity curves are shown for inhalation of benzine, benzene, styrene, and acrolein. Certain physiological and biochemical shifts have likewise been obtained showing characteristic curves of the concentration-time dependency. A graphic expression for the 'concentration-time' dependence would permit the development of a quick method for the average-day permissible amounts of atmospheric contaminants. Nomograms can be constructed to indicate physiological and biochemical shifts which may be significant in evaluating the intermittent effect as well as for developing standards for industrial and atmospheric pollutants. This research may also contribute to the theory of medical toxicology. (Auen-Wisconsin)
W76-01659

A CURRICULUM ACTIVATIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES, APPENDICES, VOLUME 2.
Environmental Protection Agency, Washington, D.C. Training Grants Branch.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $2.25. 1972. 252 p, 9 fig, 15 tab, 15 plates, 33 ref.

Descriptors: *Education, Water, *Training, *Environment, *Water pollution, On-site investigations, On-site tests, Water sampling, Sampling, Analytical techniques, Water analysis, Analysis, Laboratory tests, Chemistry, Biology, Water chemistry, Aquatic life, Aquatic environment, Bacteria, Ecology.
Identifiers: Curriculum activities guide.

Intended as a reference aid for teachers using the Curriculum Activities Guide, the appendixes provided technical information on water sampling, aquatic life, and other field investigations appropriate for students in an environmental studies course. Chemistry, bacteriology, aquatic biology, and engineering and physics were the general area covered. Basic chemical parameters of water were discussed, and testing procedures were described. Instructions for doing bacterial counts were given. Drawings were provided in a key to types of plankton and other aquatic organisms. Field methods for taking biological samples and laboratory techniques for their analysis were described. A simple flow chart explained how to interpret biological data. Mapping, flow measurement, and computer use were described in relation to water surveys. A list of references sources useful to students through the 12th grade level was given, including books, movies, periodicals, and equipment. A glossary covered basic terms on water properties, water pollution, water resources and aquatic ecosystems. (Robinson-ISWS)
W76-01660

POTENTIOMETRIC TITRATION BEHAVIOR OF SODIUM SULFIDE, METHYL MERCAPTAN, DIMETHYL SULFIDE, DIMETHYL DISULFIDE AND POLYSULFIDES IN MIXED ALKALINE SOLUTIONS AND SULFATE PULPING BLACK LIQUORS,
Borden Chemical Co., New Westminster (British Columbia).
For primary bibliographic entry see Field 5A.
W76-01670

CLEANING COAL WITH COAL: COAL HUMIC ACIDS FOR REMOVAL OF ACID, IRON, HEAVY METALS, AND ORGANIC POLLUTANTS ASSOCIATED WITH USE OF COAL AS A FUEL,
Missouri Univ., Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W76-01688

GROUNDWATER MANAGEMENT AND SALINITY CONTROL: A CASE STUDY IN NORTHWEST MEXICO,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 4B.
W76-01695

RATES OF HERBICIDES IN IRRIGATED COTTON,
Agricultural Research Service, Phoenix, Ariz.
For primary bibliographic entry see Field 3F.
W76-01698

RECOVERY OF OIL AND OIL-SOLUBLE CONTAMINANTS FROM THE SURFACE OF WATER,
R. G. Hoegberg, and W. S. Tyler.
U.S. Patnet No. 3,905,902, 5 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1234, September 16, 1975.

Descriptors: *Patents, *Oil pollution, *Oil slicks, *Water pollution control, Water pollution treatment, *Water quality control, Skimming, Equipment, Electric fields, *Separation techniques.
Identifiers: Negative electrostatic charges, Discs.

A method of recovering oil or oil-soluble contaminants from the surface of water while minimizing the simultaneous pickup of water consists of partially immersing in the water a number of discs of hydrophobic dielectric polymer which are electrostatically isolated from grounded conductors in contact with the water. The discs are rotated so that the rim portion of the discs is moved through the water to pick up oil or oil-soluble contaminants floating on the water. The discs are frictionally wiped to remove all of the picked up material from the area of contact. The frictional wiping contact and the speed of rotation of the discs triboelectrically establishes and the electrostatic isolation maintains a negative electrostatic charge on each of the discs. (Sinha-OEIS)
W76-01714

BELT DEVICE FOR COLLECTING FLOATI MATTER FROM WATER SURFACE,
Bridgestone Tire Co. Ltd., Tokyo (Jap (assignee)
K. Aramaki, H. Kawakami, and M. Suzuki
U.S. Patent No 3,907,685, 5 p, 15 fig, 9 ref; C cial Gazette of the United States Patent Off Vol 938, No 4, p 1839, September 23, 1975.

Descriptors: *Patents, *Water pollution treatm *Water pollution control, *Oil pollution, Oil sp Flotsam, Jetsam, Skimming, Equipment.
Identifiers: Endless belt.

The invention is a belt device for collecting fl ing matter from water surface comprising a pa pulleys, one of which is arranged above the w surface and the other pulley arranged below water surface, and an endless belt loosely enga with the pulleys and having a lower loosening tion inclined from a relative direction of w flow by an acute angle. The circumferential le of the endless belt is so long that the belt loo engages with the pair of pulleys. The circ ferential speed of the pulley arranged above water surface is made large as compared with of the pulley arranged below the water surf The lower loosening portion of the belt is jected to buoyancy below the surface of the w and pushed by the water flow directed toward belt so that the part of the belt positioned nea water surface becomes inclined from the w surface by a smaller angle. As a result, the lo loosening portion is liable to get intimate with surface of the layer-like floating matter smoothly pull the floating matter into the w without difficulty and further flexibly adapt waves or strong water flow directed toward belt, so that excessive collision and interferenc the belt is not caused, and the floating matter be accurately collected. (Sinha-OEIS)
W76-01722

DEVICE FOR DAMPING THE SURGE WATER WAVES PARTICULARLY FOR FLOATING BODY DESIGNED TO CLEAN P LUTED WATER,
J. Rafael.
U.S. Patent No 3,909,417, 3 p, 3 fig, 7 ref; Off Gazette of the United States Patent Office, 938, No 5, p 2399, September 30, 1975.

Descriptors: *Patents, *Water pollution con *Pollution abatement, *Oil pollution, *Oil sp *Waves(Water), *Surges, Retardance, Bo Ships, Equipment.
Identifiers: Dampening.

In order to efficiently remove the oil floating water surface, it is necessary to peel off only a tain thickness of the polluted water surface an guide it into the cleaning ship. In this inventi device is described in which oil-polluted wate be cleaned even when the sea is aroused and surge is relatively strong. A device for dampin surge of water waves is designed for use cleaning ship or other floating body and pivotable body furnished with a fin which ca immersed either partly or fully in the water whose oscillating motions caused by the w waves are damped. The damping action can b creased when the longitudinal section of the has the shape of a damped sinusoidal wave. Th achieved in that the fin damps the oncoming w with as little shock as possible. The damping b may be attached to the front of a cleaning ship can be folded back in the deck. The oncom waves are damped and the oil-covered sur layer is guided into the inlet opening of the cl ing ship. The device may be made of m plastics or inflatable rubber fabric. (Sinha-OEI W76-01731

STAGE 1 DEVELOPMENT OF THE SHO HAVEN SCHEME-I.
Snowy Mountains Engineering Corp., Co (Australia).

rimary bibliographic entry see Field 6B.
01732

ID D PRIORITIES ON THE NATIONAL
NDA FOR WATER POLLUTION CON-
Pollution Control Federation, Washington,
Research Committee.
Engelbrecht.
ssional Engineer, Vol 45, No 10, p 21-23, Oc-
1975. 2 fig, 3 tab.

iptors: *Water pollution control,
slation, *Financing, *Research and develop-
Analytical techniques, Waste water treat-
Environmental effects, Personnel.
fiers: Federal Water Pollution Control Act
dments of 1972.

985 goals of the Federal Water Pollution
ol Act Amendments of 1972 will not be met if
ovision of funds for research and qualified
ch personnel is maintained at its present
EPA financing of municipal technology R
has been greatly reduced since 1967. No ad-
ents have been made for inflation. The
er of students enrolled in water pollution
l academic programs has also decreased.
s partially due to the reduction of EPA fund-
r graduate or professional training grants.
resent training grant program will end in July
Even though present knowledge and
ology have been of undeniable use, addi-
knowledge and technology are needed if the
for further growth and development and the
sary improvement of water resources are to
nciliated. Four major aspects of research are
y reviewed: analytical techniques; waste
treatment; residue management; and en-
mental effects. (Waltner-FIRL)
01733

RONMENTAL CHEMISTRY IN THE
HERLANDS,
rloo Univ. (Ontario). Dept. of Chemistry.
rimary bibliographic entry see Field 5A.
01734

NTENANCE OF WATER QUALITY,
lin.
eyor, Vol 146, No 4344, p 7-8, September,

riptors: *Water quality control, Standards,
er pollution control, Reservoirs, Water
y, Monitoring, Waste water treatment,
lation, Chemical wastes, *Water quality
ards.

nain topics of a symposium held by the In-
ion of Water Engineers and Scientists are
wed. Protective measures for three water
es were first considered. Reservoirs are now
accessible to the public, and new means of
cting them must be found to avoid a higher
f pollution. The bulk of pollutants must be
led from river sources, and the remaining
n treated. The establishment of the river in-
monitoring, and storing, as well as an effi-
liaison system are essential for maximum
ction. Groundwater sources should be pro-
l to avoid potential areas of pollution, and
ngs, agriculture and industry should also be
ully planned. Discussion of the control of ef-
ts dealt with the legislative aspects of pollu-
control and with the problems involved in
nting water standards. The need was ex-
ed to reevaluate the bases for the application
fluent standards and to produce more effec-
creening of new chemicals involved in indus-
processes. Also discussed were the criteria
ng raw water and the means of monitoring it.
types of emergencies were listed and emer-
handling procedures based on a coordinated
gement structure with efficient communica-
were proposed. (Waltner-FIRL)

W76-01735

FACILITIES PLANS: CLEARING UP THE CONFUSION,
K. Kirk.
Journal Water Pollution Control Federation, Vol 47, No 8, p 2015-2018, August, 1975.

Descriptors: *Legislation, *Federal jurisdiction, *State jurisdiction, *Planning, Federal Water Pollution Control Act, Water pollution sources, Water pollution control, Water quality control, Administration, Regulation, Municipal water, Storm water, Water resources development.
Identifiers: Nonpoint pollution sources.

Section 208 of the Federal Water Pollution Control Act, which relates to planning activity at the state level, is discussed. In particular, Section 208(a)(6) states, 'The state shall act as the planning agency for all portions of such state which are not designated'. While it has been argued that existing basin planning is not adequate to accomplish control of nonpoint source pollution, it was also stressed that no water quality planning should be carried out for area in which problems do not exist or will not develop the 20-year planning period. Revised regulations published on July 16, 1975, are more specific as to the scope of state planning in nondesignated areas and define the state water quality management plan as a 'management document'. Initial plans must be completed and submitted to the EPA regional administrator by July 1, 1978, and adopted by July 1, 1979. Plans must assess nonpoint source problems and needs; contain a statewide antidegradation policy and methodology for its implementation; forecast both municipal and industrial facilities needs for a 20-year period; define urban and industrial storm water system needs; provide operating and implementing agencies; and analyze the various impacts of the plan. No decision has yet been made as to whether to use Section 208 funds or some other source for the state planning programs, and while regulations specify July 1979 as a plan adoption deadline, NRDC is urging November 1977 as the key date. (Kramer-FIRL)
W76-01782

EPA MONEY PROPOSALS CAUSE CONCERN,
Passiac Valley Sewerage Commission, Newark, N.J.
S. A. Lubetkin.
Water and Wastes Engineering, Vol 12, No 8, p 43-44, August, 1975.

Descriptors: *Legislation, *Federal Water Pollution Control Act, Costs, Federal jurisdiction, State jurisdiction, Construction costs, Water quality standards, Treatment facilities, Waste water treatment.
Identifiers: Federal funding, Construction grants.

Five administration proposals to amend the Federal Water Pollution Control Act Amendments of 1972, which were suggested in May 1975, are evaluated. Topics were: reduction of the federal share of project costs; limitations of federal funding of reserve capacity to service projected growth; restriction of the types of projects eligible for grant assistance; extension of the 1977 date for publically owned treatment works to meet water quality standards; and delegation of a greater portion of the management construction grants program to the states. It was argued that even if the federal share of project costs is lowered from 75% to 55%, these figures are for construction costs only, and the operation and maintenance costs will continue to be paid by the municipalities. Secondly, some flexibility must be maintained if funding of prospective growth is limited. If the types of projects eligible for grant assistance are restructed, it is suspected that this will not encourage state or local self-sufficiency. However, high priority items on both the federal and local levels should be financed first. It was strongly suggested that construction grant management programs should be delegated to a state if and only if the state has demonstrated its ability to handle it. It was also recommended that, in terms of the 1977 deadline for water quality standards, the Administrator must grand compliance schedule extensions on an ad hoc basis, upon the availability of Federal funds and upon time required to build the necessary facilities. In summary, treatment and disposal facilities should be reviewed on an individual basis, allowing cost-benefit analyses, and the municipalities should decide what is equitable. (Kramer-FIRL)
W76-01783

CLEAN WATER WILL COST $159 BILLION.
Engineering News Record, Vol 195, No 12, p 40, September 18, 1975.

Descriptors: *Waste water treatment, *Capital costs, *Operating costs, *Sewers, *Sewage treatment, *Overflow, Infiltration, Construction materials, Sludge, Biochemical oxygen demand, Water pollution control, Analytical techniques.

Results of a study by the National Commission on Water Quality on the costs of providing municipal sewage treatment at the government's standards for 1983 'best available technology' are reported. The total spending necessary is about 159 billion dollars. Of this, $79.6 billion will be used for correction of combined sewer overflows, 80% of that for construction of new storage facilities. Secondary treatment to meet the 1977 'best practicable technology' standards will cost $10.8 billion; advanced waste water treatment, $24.8 billion; rehabilitation of existing sewer systems, $9.5 billion; infiltration control, $6.9 billion; new collectors, $13 billion; and new interceptors, $13.5 billion. Expenditures are also detailed for publically owned treatment works for construction materials and collection systems. The construction time is estimated, and the majority of this will be used for improving the combined sewer overflows. With the new investment, a 60% decline in BOD and suspended solids removal is projected, as well as an increase in sludge production to a level of 14.4 million tons of sludge on a dry solids basis, because the volume of waste water will grow considerably. The decision to meet the 1977 and 1983 goals is dependent upon the condition of municipal finances and actions. (Kramer-FIRL)
W76-01784

EPA COMPLETES NEW PLANT AND SEWER INDEX DATA SERIES.
Engineering News Record, Vol 195, No 12, p 114, September 18, 1975. 3 tab.

Descriptors: Analytical techniques, *Sewers, *Costs, *Construction, Labor, Data collections, Water pollution control, Concrete, Municipal wastes, *Treatment facilities, Waste water treatment.
Identifiers: Sewer indexes, Cost indexes.

The latest Environmental Protection Agency's urban sewer system cost indexes were published and complete the set of cost data for water pollution control construction. Data are presented for 25 cities in each of three categories: 5 mgd municipal waste water treatment facilities; 50 mgd municipal waste water treatment facilities; and complete urban sewer systems. All three indexes' United States averages rose slightly in the third quarter of 1975. The new complete urban sewer system indexes were based on factors including: under labor, common labor, cement finisher, carpenter, and medium equipment operator. Labor rates included fringe benefits. Materials were concrete of the 300 psi ready-mix type, pipe of reinforced concrete, 24 inches, paving asphalt in tank cars, and lowest grade lumber (2 x 10 S4S). Needs for both old and new indexes were measured by the EPA from the results of a questionnaire given to over 100 public and private

recipients of index data. Of 98 responses, 42 expressed a need for the continuation of the old indexes. The latest United States averages for the old indexes, corrected back to June, 1974, are also presented. (Kramer-FIRL)
W76-01785

SAFE DRINKING WATER ACT, ACT I SCENE I OF HERE WE GO AGAIN,
C. W. Heckroth.
Water and Wastes Engineering, Vol 12, No 8, p 14-18, 20, 22, 24, August, 1975.

Descriptors: *Legislation, Effluents, Water treatment, Waste water treatment, Regulation, *Federal jurisdiction, State jurisdiction, *Water quality control, Public health.
Identifiers: *Safe Drinking Water Act, Cost-effectiveness.

A critical review of the new safe drinking water legislation, PL 93-523, is presented. Four areas of controversy at the American Water Works Association annual conference were the chlorine/carcinogen controversy, effluent guidelines for water treatment plant waste disposal, waste water reuse for potable water and the impact of this Act. Speaking for the EPA, John Quarles argued that the methods of achieving goals for better water quality would be more flexible and realistic than those of PL92-500. Negative reactions to the Act were expressed by some state representatives, who felt that the Federal Government will have too rigid control over areas that have been under state jurisdiction. Specific criticisms of the Safe Drinking Water Act included: the chlorine residuals portion of the Act should be amended to allow for a level of 1.0 mg/liter in the distribution system; more emphasis should be placed on corrective action, rather than reporting violations and taking samples; turbidity should not be a primary standard because that action disregards regional differences; not enough stress has been placed on inspection of systems and correction of marginal conditions; and various funding aspects are poor and the individual customers are expected to pay for increased services 'whether or not they want these services.' Overall, there is a basic difference in philosophy between the EPA and the states as to whether a water quality control program should be directed towards protection of health or towards being cost-effective. (Kramer-FIRL)
W76-01788

LOCAL LAND USE CONTROL OVER CRITICAL AREAS,
American Society of Planning Officials, Chicago, Ill.
For primary bibliographic entry see Field 6E.
W76-01790

SOME ENVIRONMENTAL PROBLEMS AND THEIR SATELLITE MONITORING,
Tel Aviv Univ., (Israel). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W76-01791

GOVERNMENT DOLLARS TO FUEL 18% GROWTH IN 1976 SEWERAGE MARKET.
Engineering News Record, Vol 195, No 13, p 10-11, October 2, 1975. 2 tab.

Descriptors: *Construction, *Sewerage, *Waste water treatment, *Treatment facilities, Tertiary treatment, Legislation, Government supports.
Identifiers: Sewerage construction.

A survey of 82 major sanitary districts indicated that they plan to spend more than twice the sewerage construction dollars in fiscal 1976 than in the preceding year. Over half the planned spending is for new or expanded treatment plants, comprising about one-third of all United States sewage construction. Earlier this year, $9 billion is impounded pollution control construction funds were released by the federal government, constituting the legislation of a demand for increased sewerage construction. Of the 82 districts reporting, 34 will have $1.9 billion worth of advanced waste water treatment plants under construction by 1979. The greatest growth in fiscal 1976 from 1975 is shown by the Middle West and Middle Atlantic districts. Southern and far western districts plan growth 60% above fiscal 1975; and 11 districts between the Mississippi River and the Rockies have plans to decrease 1976 spending by 24%. A weakness in the project-distribution is that four big cities' fiscal 1976 and 1977 predictions account for 50% of the total reporting districts. These cities--New York City, Chicago, Detroit, and Los Angeles--have $2.8 billion allotted for sewerage construction in 1976 and 1977. With trends towards higher interest rates required to market bonds, problems with municipal funding may injure the market to construction progress in the next year. (Kramer-FIRL)
W76-01794

PENNSYLVANIA USES CREATIVE APPROACH TO WATER QUALITY MANAGEMENT PLANNING,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Environmental Protection and Regulation.
H. Steigman.
Journal of Environmental Health, Vol 38, No 1, p 45-48, July-August, 1975.

Descriptors: *Water quality, *Administration, Water quality control, Water pollution control, *Pennsylvania, *Comprehensive planning.
Identifiers: Comprehensive Water Quality Management Planning Program.

Pennsylvania is designing a Comprehensive Water Quality Management Planning Program (COWAMP) which will focus on technological, environmental, economic, social and management aspects of water quality management. Results should meet the requirements of the Pennsylvania Clean Streams Law and of PL 92-500. Each of the nine study areas that the state has been divided into will have a Coordinator, Consultant, Policy Advisory Committee, a Technical/Study Advisory Committee, a Department of Environmental Resources regional offices and Areawide Planning Organization. COWAMP will include significant local participation and is of an interdisciplinary nature. A notable feature of COWAMP is its consideration of alternative environmental futures; this will consist of an environmental inventory of assets and values present in any given area, followed by the establishment of objectives and policies concerning the said values and assets. Present waste water management services in Pennsylvania are constraining and create financial inequities between neighboring areas. COWAMP's financial designs will be fully incorporated into the physical system alternatives. In this manner, it will be possible to create a financial maintainable system. (Waltner-FIRL)
W76-01796

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART I, EFFECT OF THE 'REVIEW AND COMMENT PROCESS' ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01800

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01801

THE WILLAMETTE RIVER GREENWAY: CU TURAL AND ENVIRONMENTAL INTERPLAY
Oregon State Univ., Corvallis. Dept Anthropology.
For primary bibliographic entry see Field 6G.
W76-01805

PREDICTING THE PERFORMANCE FEEDLOT CONTROL FACILITIES SPECIFIC OREGON LOCATIONS.
Oregon State Univ., Corvallis. Water Resourc Research Inst.
R. B. Wensink, and J. R. Miner.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-247 5 $4.50 in paper copy, $2.25 in microfiche. Rep WRRI-34, August 1975. 56 p, 3 fig, 10 tab, 8 ref append. OWRT A-028-ORE(1).

Descriptors: Effluents, Feedlots, Mathemati models, *Oregon, *Forecasting, *Farm wast *Agricultural runoff, Model studies, Water pol tion control, Treatment facilities, Waste tre ment. *Performance.
Identifiers: *Feedlot runoff.

In 1972 the United State Congress enacted t 'Federal Water Pollution Control Act Amer ments of 1972'. This Act required the Environme tal Protection Agency to promulgate efflue guidelines for discharges from feedlots. The guidelines permit discharge from feedlots only connection with an 'unusual rainfall' event. F 1977, the criterion is the 10 year-24 hr storm; 1983, the criterion is the 25 year-24 hr stor These criteria, however, are performance sta dards and do not represent reservoir design. mathematical simulation model was developed size feedlot runoff retention reservoirs based up previous climatological records. Two versions the model were programmed. The first, called t return period design technique, investigated t results of employing EPA's performance sta dards as design criteria. The second model, en tled the sufficient design method, determined t minimum reservoir storage volume required prevent illegal discharge as defined by the El Effluent Guidelines. The two techniques demo strated that to use design procedures based upo factor times the 10 year-24 hour or the 25 year hour storm led to designs that were either u reasonably expensive or which led to illeg discharges for which the livestock producer w subject to monetary penalties.
W76-01807

DISPOSAL OF MARINE SEWAGE: AN E VIRONMENTAL MANAGEMENT STANDAR FOR NAVAL SHIPS,
Naval Undersea Center, San Diego, Calif.
C. A. Farrell, Jr.
Available from the National Technical Inform tion Service, Springfield, Va 22161, as AD-7 761, $3.50 in paper copy, $2.25 in microfiche. R port NUC TP 323, June 1972. 16 p, 8 tab, 6 ref append.

Descriptors: *Water pollution, *Sewage dispos *Harbors, *Ships, Sewage treatment, Regulatio Standards, Cost analysis, Cost comparisons, Co benefit analysis, Bays, Estuaries, Waste dispos Waste water disposal, Waste water(Pollution).
Identifiers: *Marine sewage.

Information on the problem of vessel wa disposal was provided, the Environmental Prot tion Agency's proposed secondary treatment sta dard for marine sanitary devices was reviewe and an alternate standard for U.S. Navy ships w recommend. The alternate standard, based on vironmental management considerations, wou permit Navy ships to discharge raw sewage ov board while in transit but would require sewage, human and domestic, to be pump ashore while ships are moored. Under the ternate standard the contribution of Navy ships

ogical oxygen demand and suspended solids in ted States harbors would be reduced by ap-ximately 95%, whereas the EPA standard will ieve a reduction of less than 70%. In addition alternate standard would reduce by an esti-ed 68% of 19.7 million dollars annually the ned cost to the Navy of meeting the EPA stan-d by installing a sewage holding system on al ships. (Sims-ISWS)
5-01828

MOTE SENSING OF COAL MINE POLLU-N IN THE UPPER POTOMAC RIVER SIN.
bionics, Inc., Washington, D.C.
primary bibliographic entry see Field 5B.
5-01831

VELOPMENT OF A HIGH SEAS OIL COVERY SYSTEM, APPENDIX II,
an Systems, Inc., Reston, Va.
. March, R. L. Beach, R. P. Bishop, T. H. ckwick, and R. K. Sahgal.
ilable from the National Technical Informa-Service, Springfield, Va 22161, as AD-759 $10.00 in paper copy, $2.25 in microfiche. al Report 724103.06.1, February 1972. 358 p, fig, 28 tab, 15 ref, 5 append. DOT-CG11,542A.

criptors: *Oil spills, *Model studies, boratory tests, Oil, Waves(Water), Barriers, luation, Hydraulic models, Oceans, Weirs, earch and development, Equipment, Pump ing, Pumps, Oil production, Water pollution trol.
ntifiers: *Oil spill recovery.

odel test development program was conducted a double weir oil recovery system for rapid overy of oil spilled on the high seas. The tests ducted showed the recovery system to be able of recovering spilled oil at high efficien-s (less than 10% water in the recovered oil) at a gpm flow rate under environmental conditions ging from calm to low State 5 seas (8' signifi-t wave height) and in currents up to 3 knots. system efficiency was relatively independent oil specific gravity, viscosity, oil film thickness, d and wave conditions, oil-water interfacial sion, surface temperatures, and variation in sig-cant oil type when towed at speeds of 1 to 3 ts. Efficiencies of 90-100% can be expected er these conditions. The system effectiveness flow rate) was relatively independent of wind wave conditions, surface temperature, oil cific gravity, oil-water interfacial tension, and nificant oil type variation. The effectiveness of weir/basin unit was not affected by viscosities excess of 100,000 centistrokes, but the oil nsfer system effectiveness dropped below 2000 n for oil viscosities in excess of 2-3000 centis-kes. A detailed discussion of three-dimensional keeping tests, pump and control system tests, -scale model tests with oil, tradeoff studies and tem design drawings were presented. (See also 5-09660) (Humphreys-ISWS)
6-01835

TIVITIES AND NEEDS RELATED TO DIOACTIVITY STANDARDS FOR EN-RONMENTAL MEASUREMENTS.
k Ridge National Lab., Tenn.
r primary bibliographic entry see Field 5A.
6-01861

-DIP VERSUS DOWN-DIP MINING, AN ALUATION,
elly and Loy, Harrisburg, Pa.
W. Mentz, and J. B. Warg.
vironmental Protection Agency, Report EPA-0/2-75-047, June 1975. 73 p, 12 fig, 9 tab, 8 ref. B040; ROAP 61AAD; Task 016. 68-01-0465.

Descriptors: Water quality, *Coal mines, Cost comparisons, *Water pollution, Mine waters, Ground water, Drainage, *Evaluation, Feasibility studies, Water quality standards.
Identifiers: *Mining methods, Down-dip mines, Up-dip mines.

Detailed results are presented of a feasibility study of down-dip mining, a technique that appears to offer an alternative to sealing or permanent treatment of polluted effluents from coal mines after abandonment. The project included an evaluation of a pair of nearly identical abandoned underground mines - one developed to rise, one developed to dip - to confirm the theory that discharge water quality in down-dip mines is substantially better than that in up-dip mines. An active mine with units operating up-dip and down-dip was also evaluated to ascertain economic and engineering limitations, costs in varying situations, and other major advantages or disadvantages of each mode of operation. Health and safety and National water quality and economic impacts of widespread use versus non-use of the technique were also assessed. (EPA)
W76-01868

METHODS TO TREAT, CONTROL AND MONITOR SPILLED HAZARDOUS MATERIALS,
Calspan Corp., Buffalo, N.Y.
R. J. Pilie, R. E. Baier, R. C. Ziegler, R. P. Leonard, and J. G. Michalovic.
Environmental Protection Agency, Report EPA-670/2-75-042, June 1975. 137 p, 33 fig, 27 tab, 4 ref. 1BB041; ROAP 21AVN; Task 033. 68-01-0110.

Descriptors: *Water treatment, *Activated carbon, *Gelation, *Waste water treatment, Biology, Neutralization, Monitoring, Bioassay.
Identifiers: Hazardous materials spill, Hazardous chemical spills, Cyclic colorimeter, Universal gelling agent.

The feasibility of treating, controlling and monitoring spills of hazardous materials was studied. Emphasis was placed on considering techniques and equipment which would be applicable to general classes of chemicals rather than to specific hazardous polluting substances. Several methods were found to be promising for removing or detoxifying spills of hazardous chemicals 'in-situ'. These included: the use of sodium sulfide as a precipitating agent for spills of heavy metal ion solutions; the use of activated carbon packaged in porous fiber bags (carbon 'tea bags') for adsorbing a wide variety of soluble organic chemicals; and the use of various acids or bases to neutralize spills. Methods were studied to control spills on land and prevent their contaminating nearby surface or ground water. A four-component 'universal gelling agent' was developed to immobilize a spilled liquid. A 'cyclic colorimeter', a novel heavy metal ion detector, was perfected and laboratory tested, and a detection kit capable of sensing several chemicals was developed. A computer model was developed and refined to simulate the spread of a spill when certain stream parameters and material characteristics are known. Bioassay studies were conducted for several chemicals using at least three species of biota. In addition, bioassays were conducted to estimate the environmental effect of each of the various treatment methods developed. (EPA)
W76-01869

WATER QUALITY CONTROL IN MINE SPOILS, UPPER COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins.
D. B. McWhorter, R. K. Skogerboe, and G. V. Skogerboe.
Environmental Protection Agency, Report EPA-670/2-75-048, June 1975. 99 p, 13 fig, 10 tab, 20 ref, 7 append. 1BB040; ROAP 21BDU; Task 02. R802621.

Descriptors: Coal mines, *Strip mining, Waste disposal, Drainage, Mine waters, *Water pollution, Water quality, *Groundwater, Water chemistry, Salinity, Soil chemistry, Solubility, Runoff, *Colorado River Basin.
Identifiers: Strip mine wastes, Upper Colorado River Basin.

The purpose was to identify potential water quality problems associated with runoff and percolation through mine spoils at selected sites in the Upper Colorado River Basin. The results show that the production of soluble salts from mine spoils into receiving waters is probably the most significant water quality problem that can be expected. No significant release of heavy metals was observed in the coal mine spoils studied. Some significant heavy metal concentrations were observed in the stream below the tailings disposal area from a copper-lead-zinc mill. A portion of these metals is contributed by the tailings, but a variety of old mines and mine dumps also make a contribution. The quality of percolate and runoff from spoils corresponds to the constituents of extracts prepared from saturated pastes of the spoil material. A method of estimating salt production into receiving waters was derived and found to agree very well with measured salt pickup at one coal site. The minimum quantities of salts that will eventually be released from the spoils studied are estimated. (EPA)
W76-01870

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1974 - FEBRUARY 1975,
California Univ., Santa Barbara. Marine Science Inst.
F. A. DeWitt, Jr., and P. Melvin.
Environmental Protection Agency, Report EPA-670/2-75-044, May 1975. 260 p. 1BB041; ROAP 21BEA; TASK 008. R-803063.

Descriptors: *Bibliographies, *Oil spills, *Oil pollution, Patents, Water pollution control, *Documentation, Pollution abatement, *Research and development.
Identifiers: *Oil spill events.

The November 1974 - February 1975 Oil Spill and Oil Pollution Reports is the second quarterly compilation of oil spill events and oil pollution report summaries. Presented are: (a) summaries of oil spill events; (b) summaries and bibliographic literature citations; (c) summaries of current research projects; and (d) patent summaries. (See also W76-01873 and W75-07689) (EPA)
W76-01872

OIL SPILL AND OIL POLLUTION REPORTS FEBRUARY 1975 - APRIL 1975,
California Univ., Santa Barbara. Marine Science Inst.
F. A. DeWitt, Jr., and P. Melvin.
Environmental Protection Agency, Report EPA-670/2-75-059, June 1975. 234 p. 1BB041 (ROAP 21BEA, Task 008). R-803063.

Descriptors: *Bibliographies, *Oil spills, *Oil pollution, *Patents, Water pollution control, Documentation, Pollution abatement, Research and development.
Identifiers: Oil spill events.

This report is the third quarterly compilation of oil spill events and oil pollution report summaries. Presented are: (a) summaries of oil spill events; (b) summaries and bibliographic literature citations; (c) summaries of current research projects; and (d) patent summaries. (See also W76-01872 and W75-07689) (EPA)
W76-01873

CONTROLLING SULFIDES IN SANITARY SEWERS USING AIR AND OXYGEN,
R. J. Sewell.

Environmental Protection Agency, Report EPA-670/2-75o060, June 1975. 111 p, 27 fig, 22 tab, 56 ref. 1BB043 (ROAP 21ASW, Task 008). 11010 DYO.

Descriptors: *Odor, Corrosion control, Hydrogen sulfide, *Aeration, Oxygen, Sewers.
Identifiers: *Sulfide control, U-tubes, Pressure tanks, Lift stations, *Odor control, Force mains, Diffusers.

Ambient sulfide conditions and corrosion rates in a sanitary sewerage system are described, and results are presented of a study that demonstrated that the use of air or pure oxygen is effective in controlling sulfides. The three techniques used to entrain the gases in the sewage included injection, U-Tubes, and pressure tanks. Sulfide control was evaluated at eight separate locations involving lift stations, force mains, and receiving gravity lines. The entrainment techniques studied were not optimized. However, odor and corrosion problems were abated. Preliminary cost data indicated that air injection into force mains, and the use of air with the U-Tube were the least costly sulfide control measures. (EPA)
W76-01877

AQUATIC HERBICIDES AND THE CONTROL OF WATER WEEDS,
Cambridge Univ. (England). Dept. of Applied Biology.
M. P. Brooker, and R. W. Edwards.
WATER Research, Vol 9, No 1, p 1-15, January 1975. 7 tab, 2 fig, 136 ref.

Descriptors: *Aquatic weed control, *2-4-D, *Dalapon, *Diquat, *Paraquat, *Herbicides, *Food webs, *Biological communities, *Aquatic flora, *Water quality, *Environmental effects, 2-6-dichlorobenil, Aquatic fauna, Toxicity, Dissolved oxygen, Plant growth regulators.
Identifiers: *Maleic hydrazide.

The application of herbicides for the control of aquatic plants produces two groups of effects. The primary or direct effects result from the spectrum of toxic action of the herbicide itself on aquatic and, after abstraction, terrestrial organisms. The secondary or indirect effects result from the death of the plants, and consequent changes in the physical, chemical and biological nature of a treated water body, changes which may interfere with abstracted uses. Such effects are reviewed, particularly where they constrain other water resource uses or differ from effects resulting from cutting and removal. Concerning direct effects, the losses of aquatic herbicides from water and their toxicity to mammals, aquatic fauna and crop plants are considered together with the implications of different methods of herbicide application. Possible methods of removing aquatic herbicides from water supplies are described. The major ecological changes following the use of aquatic herbicides are indirect resulting from the destruction of the aquatic plants. The death and decay of submerged aquatic plants is likely to perturb the oxygen-carbon dioxide balance of the water and other changes in water quality are likely to occur. Loss of habitat and changes in available food resources may result in changes in the aquatic fauna. Replacement growths of plants (macro- or micro) may cause problems in relation to drainage functions, water abstractions and recreational facilities. (Katz)
W76-01911

HYDROGEN PEROXIDE AS A SOURCE OF OXYGEN SUPPLY IN THE TRANSPORT OF FISH FRY,
Institute of Science, Nagpur (India). Dept. of Zoology.
V. B. Marathe, N. V. Huilgol, and S. G. Patil.
The Progressive Fish-Culturist, Vol 37, No 2, p 117, April 1975.

Descriptors: *Dissolved oxygen, *Water quality, Fry, Transportation, Fish stocking, Methodology.
Identifiers: *Hydrogen peroxide, Cyprinus carpio

Hydrogen peroxide was a good agent for replenishing the dissolved oxygen of water during the transport of fish fry provided it was used so that the dissolved oxygen value of water did not exceed the normal requirement of the fry. Hydrogen peroxide was harmful if used indiscriminately and predetermination of the dosage was advised. (Klein)
W76-01931

THE INFLUENCE OF EMBANKMENTS ON THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN THE ARCHIPELAGO OF FOGLO, ALAND,
Abo Akademi, Turku (Finland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W76-01940

COMPREHENSIVE WETLANDS PROTECTION: ONE STEP CLOSER TO FULL IMPLEMENTATION OF SECTION 404 OF THE FWPCA.
For primary bibliographic entry see Field 6E.
W76-01955

ANTITRUST AND POLLUTION CONTROL: AN EPA PERSPECTIVE,
Environmental Protection Agency, Washington, D.C. Office of General Counsel.
R. V. Zener.
University of Pittsburgh Law Review, Vol 36, No 3, p 705-714, 1975. 10 p, 30 ref.

Descriptors: *Research and development, *Research facilities, Technology, *Water pollution control, *Air pollution effects, Research priorities, Pollution abatement, Water pollution treatment, Legal aspects, Constraints, Regulation, Penalties(Legal), Water, Water law, Environmental effects, Legislation, Law enforcement.
Identifiers: *Antitrust laws, *Consumers.

There has been considerable discussion concerning the application of antitrust laws to joint research and development for pollution control. A basic premise of the antitrust laws is that competition is the best stimulus for product improvement. Consumers generalyy are willing to absorb the cost of research when it leads to a more efficient product; and industry, in turn, is willing to engage in such research to realize a competitive advantage. The proponents of joint research for pollution control, however, argue that this premise does not apply where the gains from research are largely social. Consequently, they urge, joint research and development may be the only realistic method for the realization of social benefits. Nevertheless, problems would exist if such joint ventures were expected from antitrust regulation. For example, it would be unthinkable to allow companies engaged in development and sale for profit of pollution control equipment to engage in joint research outside the reach of antitrust laws. Another potential problem is that when there is no competitive advantage to the development of innovative technology, a conspiracy to retard development is obviously easier to maintain. Additional arguments, pro and con, are presented concerning whether joint research and development for pollution control should be subject to antitrust laws. (Hoffman-Florida)
W76-01958

WATER QUALITY STANDARDS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PRODUCTIVE BUT UNREALISTIC,
S. F. Unger.
Gonzaga Law Review, Vol 10, No 1, p 165-180, 1974. 16 p, 89 ref.

Descriptors *Economic feasibility, *Adoption practices, *Federal Water Pollution Control A *Water quality standards, *Industrial wast Regulation, Technology, Effluents, Polit aspects, Economic impact, Economic efficien Tangible benefits, Water pollution treatme Waste treatment, Waste disposal, Econor justification, Water quality, Federal governme Planning, Legislation, Technology.
Identifiers *Effluent limitations, Po sources(Pollution), Funding, *Federal Water P lution Control Act Ammendemnts of 1972.

The emphasis of the Federal Water Pollution C trol Act Amendments of 1972 is primarily on tre ment, by the best technology available, discharges at specific point sources. The Ame ments provide a two step process for the achie ment of the required effluent levels. Phase O requires industries to utilize by 1977 the practi ble control technology currently available. Ph Two extends to 1983 and requires industry eit to achieve no discharge or to utilize the b available technology economically achieval These new standards will require drastic exper tures by some companies since 'best availa technology' refers to the best performing compa in a particular industrial category, while 'b practicable technology' refers to the average the most efficient performers. Barriers to full co pliance with the 1972 Amendments explored h include: (1) high costs; (2) insufficient fede funding for research and construction; (3) indus opposition; and (4) the political effects of Wat gate on the nation's pollution control prograr While the 1972 Amendments will doubtless hav beneficial effect on the nation's waterways, i arguable that the water quality standards requi will create costs far greater than any soc benefits resulting. (Hoffman-Florida)
W76-01959

THE FUTURE OF ENVIRONMENT DEFENSE,
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-01961

IMPROVEMENT OF THE QUALITY WATER SUPPLY SOURCES (POLICY STAT MENT OF AMERICAN WATER WORKS SOCIATION).
For primary bibliographic entry see Field 6E.
W76-01962

THE SAFE DRINKING WATER ACT A EPA'S ROLE IN TRAINING,
Environmental Protection Agency, Washingt D.C., Division of Water Supply.
J. H. McDermott.
Journal of the American Water Works Assoc tion. Vol 67, No 8, p 441-42, August, 1975. 2 p illus, 2 ref.

Descriptors: *Potable water, *Trainii *Education, *Scientific personnel, *Public ut ties, Legislation, Public health, Environmen sanitation, Occupations, Personnel, Person management, Water supply development, Wa utilization, Water conservation, Domestic wat Water quality, Water purification, Water pol tion, Governmental interrelations, Economi Costs, Cost allocation, Federal government, St governments.
Identifiers: *Safe Drinking Water Act.

The Safe Drinking Water Act recognizes the siz ble training needs exist for community wat supply systems personnel and that such needs c be met only by a cooperative federal, state, lo effort utilizing the capabilities of both public a private sectors. For example, the 1970 Commun Water Supply Study indicates that 63% of oper ing personnel have no formal training in sanita microbiology and, for systems that provide tre

it other than disinfection, 46% have no formal ning in chemistry. In addition, estimates in- ate that personnel in state water-supply posi- s will have to be increased ten-fold in order to port optimum state programs. The Environ- ital Protection Agency will have primary ponsibility in developing and supporting train- programs. The cost of this training will include ct costs, for providing the programs them- es, and indirect costs, such as the higher sala- that will be needed to attract and retain lified personnel. However, because this train- workload will be so formitable, it is clear that major costs must be borne not by the EPA, but the utility itself as a basic cost of doing busi- s. (Hoffman-Florida)
6-01963

IMINAL PROSECUTION UNDER THE ASKA ENVIRONMENTAL CONSERVATION T OF 1971: STOCK V STATE,
D. Taron.
LA-Alaska Law Rev, Vol 4, No 4, p 387-418, 5, 32 p, 177 ref.

scriptors: *Alaska, *Environmental control, ater pollution control, *Penalties(Legal), *Law orcement, Legislation, Regulation, State ju- diction, Legal aspects, Water law, Water pol- , Judicial decisions, Drainage, Potable water, blic health, State governments, Water pollution irces.
ntifiers: *Criminal law, Orders, Directives.

e Alaska Environmental Conservation Act was acted in 1971 to halt environmental degradation. e purpose of this Comment is to inform askans of the criminal sanctions embodied in the te's environmental control law. A schematic ex- ination of the criminal provisions of the Act eals the types of conduct prescribed by the law. general, the provisions fall into three catego- s; violation of department orders and directives, ecific prohibitions, and the general prohibition tute. Department orders contain provisions for termining when an order may issue, and when it order becomes effective. Specific prohibitions lude regulations promulgated by the depart- nt and statutory prohibitions drafted by the islature. The general prohibition statue consists a single provision which broadly prescribes pol- ion in general and makes polluters strictly liable any violations. Finally, some of the Act's more portant criminal provisions are examined in ht of the recent Alaska Supreme Court case, ock v State in which corporate officials were ld responsible for the drainage of raw sewage o waters reserved for drinking purposes. offman-Florida)
76-01967

ATER MANAGEMENT IN ONTARIO--AN CONOMIC EVALUATION OF PUBLIC POL- Y,
itish Columbia Univ., Vancouver. Dept. of conomics.
r primary bibliographic entry see Field 6B.
76-01969

WARD AN INTERNATIONAL STANDARD ENVIRONMENT,
orgetown Univ., Washington, D.C. School of w.
r primary bibliographic entry see Field 6E
76-01970

ST CASE ON OCEAN DUMPING: MUST HILADELPHIA MOVE TOWARD ON-LAND SPOSAL OF SEWAGE SLUDGE.
vironmental Law Reporter, Vol 5, No 9, p 144-10147, 1975, 4 p.

escriptors: *Waste disposal, *Pennsylvania, Waste dumps, *Sea water, *Permits, Solid wastes, Waste water disposal, Sludge, Industrial wastes, Organic wastes, Administrative decisions, Administration, Administrative agencies, Law enforcement, Legal aspects, Ultimate disposal, Water pollution control, Legislation, Public health, Environmental effects, Water quality control, Standards.
Identifiers: *Ocean dumping, *Land-based waste disposal, *Philadelphia(Penn).

The Marine Protection, Research, and Sanctuaries Act of 1972 was passed to regulate the dumping of all types of materials into ocean waters and to prevent or restrict the dumping of harmful materials into ocean waters. Discussed here is a statute requiring the design and implementation of land-based waste disposal projects. To help achieve this goal the Administrator of the Environmental Protection Agency (EPA) has the discretion to issue interim permits for ocean dumping to those who have started the sometimes long process of implementing land-based waste disposal. Until recently, the EPA has been lax in enforcing permit requirements. In 1975, however, the EPA ordered Philadelphia to cut all ocean sludge dumping in half by 1979, and to end it completely by 1981. The city has asked that this regional decision be reviewed by the Administrator. The Administrator's ruling, to be delivered in the fall of 1975, should have a significant impact on the future of land based waste disposal projects.
W76-01971

E L I CONCLUDES WATER ACT ENFORCEMENT STUDY.
Environmental Law Reporter, Vol 5, No 9, p 10158-10161, 1975, 4 p.

Descriptors: *Federal Water Pollution Control Act, *Administrative agencies, Law enforcement, *Coordination, *Adjudication procedure, Water law, Water policy, Legal aspects, Penalties(Legal), Water quality control, Decision making, Governmental interrelations, Remedies, Administration, Regulation, Administrative decisions, State governments, Social aspects, Water pollution control, Water management.
Identifiers: Administrative remedies, Judicial remedies.

Law enforcement under the Federal Water Poilution Control Act Amendments of 1972 was the topic of a recent study by the Environmental Law Institute (ELI). This article presents a summary of the Institute's findings and summaries. The study found that pollution control agencies were reluctant to issue warnings and orders and generally preferred to use informal cooperation when dealing with dischargers. While such cooperation was generally beneficial, it was sometimes found to result in inconsistent decisions which often created internal conflict over enforcement policies. The study also found that administrative remedies are generally more productive than judicial remedies in dealing with dischargers. A major advantage of administrative action is that it is quick and inexpensive. In addition, it allows the agency to work with the discharger. Litigation, on the other hand, is time-consuming, expensive, and often provokes a discharger to assume a combative attitude that further delays compliance. A review of inter- and intra-governmental relations found cooperation between the Environmental Protection Agency, United States Attorneys, and the Justice Department to be good. Relations between state water pollution agencies and state attorney generals, however, were frequently found to be poor. (Hoffman-Florida)
W76-01972

MORELAND V ACADIAN MOBILE HOMES PARK, INCORPORATED (INTERFERANCE WITH NATURAL DRAINAGE).
For primary bibliographic entry see Field 6E.
W76-01974

SUN ENTERPRISES, LTD V TRAIN (DREDGING AND SEWAGE DISPOSAL IN WETLANDS).
For primary bibliographic entry see Field 6E.
W76-01976

UNITED STATES V RESERVE MINING COMPANY (DISCHARGE OF TACONITE TAILINGS INTO LAKE SUPERIOR).
For primary bibliographic entry see Field 6E.
W76-01977

P F Z PROPERTIES, INC V TRAIN (DREDGING AND DEVELOPMENT OF MANGROVE WETLANDS).
For primary bibliographic entry see Field 6E.
W76-01978

COMMITTEE TO SAVE LAKE MURRAY V. FEDERAL POWER COMM'N (DISCHARGE OF TREATED EFFLUENT INTO LAKE).
For primary bibliographic entry see Field 6E.
W76-01981

UNITED STATES V. INDEPENDENT BULK TRANSPORT (OIL SPILL DAMAGES),
For primary bibliographic entry see Field 6E.
W76-01984

PUBLIX SUPER MARKETS, INC V PEARSON (FILLING OF WATER FILLED PHOSPHATE PITS).
For primary bibliographic entry see Field 6E.
W76-01985

WATER CONTROL (REGULATING POLLUTION AND DISCHARGE OF UNTREATED WASTES INTO MISSISSIPPI RIVER).
For primary bibliographic entry see Field 6E.
W76-01987

CITIES SERVICE COMPANY V. STATE OF FLORIDA (ACTION BY STATE FOR DAMAGES AND INJUNCTIVE RELIEF ARISING OUT OF BREAK IN DAM IMPOUNDING PHOSPHATE SLIME).
For primary bibliographic entry see Field 6E.
W76-01988

SOCIETY FOR PROTECTION OF NEW HAMPSHIRE FORESTS V. SITE EVALUATION COMMITTEE (APPEAL BY GROUP OPPOSING LOCATION OF NUCLEAR GENERATING FACILITY ALLEGING ADVERSE AFFECT ON WATER QUALITY).
For primary bibliographic entry see Field 6E.
W76-01990

MARINE POLLUTION-PREVENTION-WASTES, ETC.
For primary bibliographic entry see Field 6E.
W76-01992

BURGESS MINING AND CONSTRUCTION CORPORATION V. STATE EX REL BAXLEY (ACTION BY STATE FOR DAMAGES RESULTING FROM MINING COMPANY'S ALLEGED POLLUTING OF RIVER).
For primary bibliographic entry see Field 6E.
W76-01993

NATURAL RESOURCES DEFENSE COUNCIL, INC. V. TRAIN (FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS).
For primary bibliographic entry see Field 6E.
W76-01995

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

HIERACHICAL MANAGEMENT OF GROUND AND SURFACE WATER SYSTEM VIA MULTICELL APPROACH,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4A.
W76-01501

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert School of Industrial Administration. Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01508

A SIMULATION APPROACH TO THE ANALYSIS OF UNCERTAINTY IN PUBLIC WATER RESOURCES PROJECTS,
Georgia Univ., Athens, Inst. of Natural Resources.
For primary bibliographic entry see Field 6B.
W76-01510

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SIXTH VOLUME.
Office of Water Research and Technology, Washington, D.C.
Available from the National Technical Information Service Springfield, Va 22161 as PB247-098, $12.50 in paper copy, $2.25 in microfiche. Water Resources Scientific Information Center, OWRT/WRSIC 75-201, September 1975, 481 p, Edited by Daniel P. Loucks, Cornell University, Ithaca, New York.

Descriptors: *Systems analysis, *Bibliographies, *Water resources, Development, **Optimization, Simulation analysis, Operations research, Abstracts, Planning, Management, Alternative planning.

This is an annotated bibliography consisting of 301 abstracts of selected publications issued in 1973 and 1974 pertaining to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. The first two volumes of this bibliography, having the same title, were published by the Cornell University Water Resources and Marine Sciences Center, Ithaca, New York (Publication 25, August 1969; Publication 35, June 1971); the third, fourth and fifth volumes were published by the Water Resources Scientific Information Center in December 1972, December 1973, and July 1974, respectively. Both subject and author indexes are provided. Descriptors are listed with each abstract. The abstracted material emphasizes the application of optimization and simulation techniques for assisting the planning and management of water resource systems. (See also W75-11574).
W76-01517

TOWARDS SYSTEM MODELS FOR WATER RESOURCE MANAGEMENT--A COMMENT,
Department of the Environment, London (England). Systems Analysis Research Unit.
P. G. O'Neill.
Journal of Environment Management, (U.K.), Vol 2, No 1, p 79-82, 1974. 4 ref.

Descriptors: *Mathematical models, Water resources, Planning, Optimization, Model studies, Decision making, *Reviews.
Identifiers: State-of-the-art, England.

The effectiveness of system models in water resources management is considered. Models seeking minimal operating costs have found some limited use for linear programming formulations, primarily where sources are mainly groundwater. Generally, however, the non-linearity of the physical relations involved has lead researchers to prefer dynamic programming, or hill-climbing methods using simulation of sub-programs. Models have been used to derive the optimal costs relationship, discounting, and evaluating initial underutilization of a system. Dynamic programming has not been of great help in resource management because of the problem of dimensionality but has proved useful in the determination of the optimal combination of effluent-treatment and water-treatment plants along the course of a river and could potentially be used for both waste disposal and public water supply. Systems models can and do offer useful guidance to the implications of alternative philosophies of management, but the real issues in water resource management are political and their resolution requires many interdisciplinary skills. While it is tempting to aim at the optimization of system development and control in terms of maximizing net social welfare even this objective is deterred by the absence of any objective criterion for the distribution as opposed to the allocative implications of a strategy. (Auen-Wisconsin)
W76-01603

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01616

BAYESIAN INFERENCE AND DECISION MAKING FOR EXTREME HYDROLOGIC EVENTS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 4A.
W76-01761

THE SANTA ANA RIVER BASIN: AN EXAMPLE OF THE USE OF COMPUTER GRAPHICS IN REGIONAL PLAN EVALUATIONS.
Steinitz Rogers Associates, Inc., Cambridge, Mass.
IWR Contract Report 75-3, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, June 1975. 290 p, 117 fig, 10 tab, 27 ref.

Descriptors: *Watersheds(Basins), *Planning, *Computer programs, Methodology, Graphical methods, Land use, Evaluation, Effects, Alternative planning, Water resources, Decision making, Forecasting, Regions, Systems analysis.
Identifiers: *Computer graphics, *Upper Santa Ana River basin(Cal), Environmental impact studies, Data bank, Land use patterns, Locational attractiveness models, Matrix models, Weighted indices.

Solutions to most problems of watershed management require large amounts of information regarding natural resources, land use, and social needs. This report explores the possibilities of computer graphics as a tool in the process of watershed planning. Considered is a research project involving a study of the Upper Santa Ana River Basin in California and addressing techniques for predicting future land use patterns, analyzing the effects of future land use on resources, identifying desirable alternative plans for resource development, and applying these methods toward the generation of environmental impact studies, particularly for regional-scale development decisions. The project consisted of the creation of a computerized data bank of site resources and land use elements, the development of locational attractiveness models defined by major activities or land uses occurring in the basin and the identification of the criteria which define land use decisions, the analysis of the vulnerability of various natural systems to impacts caused by future land use change, and the analysis of the attractiveness models and the impact models by evaluating two locally specific land use plans. Weighted indices were used to evaluate land use locations, matrix models to evaluate the resource impacts of land use patterns and computer programming to relate the model information to specific land areas. The GRID computer program (Harvard University, 1968) accomplishes data organization, analysis, and display. (Bell Cornell)
W76-01899

6B. Evaluation Process

WATER QUALITY CONTROL AND BUSINESS BEHAVIOR, WISCONSIN UNIV., MADISON. GRADUATE SCHOOL OF BUSINESS ADMINISTRATIONS,
Wisconsin Univ., Madison. Graduate School Business Administration.
For primary bibliographic entry see Field 5G.
W76-01505

A SIMULATION APPROACH TO THE ANALYSIS OF UNCERTAINTY IN PUBLIC WATER RESOURCES PROJECTS,
Georgia Univ., Athens, Inst. of Natural Resources.
B. W. Taylor, and R. M. North.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-11 $5.00 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC 1375, September 1975, 73 p, 4 fig, 10 tab, 57 ref. OWRT A-052-GA(1). 14-13-31-0001-4010

Descriptors: *Evaluation, *Project feasibility, *Project planning, *Benefits, *Costs, *Risk, *Simulation analysis, Georgia, Estimating, Investment, Monte Carlo method, Cost-benefit ratio.
Identifiers: Spewrell Bluff Project(Geo).

The existing economic criteria for evaluating water resource projects are deterministic and therefore incomplete since these criteria do not include any consideration of uncertainty of possible outcomes. A Monte Carlo simulation approach was used to generate values for a mean and a standard deviation for the benefits, costs, benefit-cost ratios and net present values for the Spewrell Bluff Project in Georgia to demonstrate the variability of probable outcomes from investing public funds in the project. A triangular distribution of most likely, most optimistic, and most pessimistic estimates of project managers within the Corps of Engineers formed the basis for the simulation. Additional estimates were obtained from outside sources for comparative estimates of project variability and as a test for the internal estimates. Comparable measures of expected mean values and variability of outcomes for all projects could lead to better investment decisions and reduce controversy over water resource projects.
W76-01510

PLANNING FOR COASTAL RECREATION OPPORTUNITIES NEAR LARGE URBAN AREAS: A STUDY RELATING TRANSPORTATION AND RECREATION,
INTASA, Menlo Park, Calif.
D. P. Lijesen, Y. Snir, J. Rosing, and K. Skurski.
Available from the National Technical Information Service, Springfield, Va 22161 as PB247-12 $5.50 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 110 p, 15 fig, 18 tab, 23 ref, 2 append. OWRTC-5213(No. 4234)(1).

Descriptors: *Transportation, *Recreation, *Access routes, Recreation demand, Planning, Coasts, Methodology, Competing uses, Water resources development, Planning coordination,

term planning, Estimated benefits, Comve benefits, Comparative costs, Computer l, Pacific coast region, *California, Beaches, nable use, Environmental effects.
fiers: California central coastal zone, Sen- y analysis, Comparative analysis, Recreation ansportation plans, Recreation accessibility l, Public information, Recreation planning rios.

ation research is traditionally either ior-oriented or directed towards methodolo- or economic benefit evaluation of recreation :ts; recreation planning generally produces a nent indicating how, when and where recrea- opportunities are to be provided. General ition research and functional planning are m mutually influential nor do they provide asis for informed decision making by the :. The thrust of this research was to identify pe of information that the recreation planner d develop during the planning process in to formulate plans that include the issues of rn to people who will ultimately accept or re- plan. A sensitivity approach is proposed to op information on level and geographic dis- ion of recreational visitation, a key input ds determining the final implications as- ed with recreation plans. An approach is nted for modeling the accessibility of recrea- esources as a function of demand for activi- upply of opportunities, and the highway net- connecting demand centers and supply . The specific case of planning for coastal ation opportunities along the California Cen- oastal Zone near the San Francisco-Oakland- ose and Fresno metropolitan areas was used monstrate the usefulness of the methodology ictional recreation planning.
01516

S RESERVOIR ENVIRONMENTAL DY, SUMMARY REPORT.
State Water Resources Research Inst.,
rimary bibliographic entry see Field 4A.
01522

ATER QUALITY CONTROL PLAN FOR SAN FRANCISCO BAY BASIN, PART 1.
rimary bibliographic entry see Field 5G.
01593

ATER QUALITY CONTROL PLAN FOR FRANCISCO BAY BASIN, PART 2.
rimary bibliographic entry see Field 5G.
01594

LYSIS OF THEORIES AND METHODS ESTIMATING BENEFITS OF PROTECT- URBAN FLOOD PLAINS,
ington Univ., St. Louis, Mo., Inst. for Urban egional Studies.
eenberg, C. L. Leven, and A. Schlottmann.
lable from the National Technical Informa- Service, Springfield, Va 22161 as AD/A-005 $5.50 in paper copy, $2.25 in microfiche. ared for Army Engineer Institute for Water urces, Fort Belvoir, Va. Final report, mber, 1974. 104 p, 5 fig, 7 tab, 23 ref, 3 ap- DAWC-31-74-C-0054.

riptors: *Cost-benefit analysis, *Estimated fits, *Environmental effects, *Regression sis, *Model studies, *Flood plains, *Linear amming, Intangible benefits, Social aspects, arch and development, Land use.
ifiers: Urban flood plains, Land values, ral equilibrium locational model, INTASA l, Weisz model, St. Louis(Mo), Urban stu-

l control projects have been developed based e sole criteria of benefits exceeding costs by determining present value of all benefits and costs, determining the effective life of the project and estimating construction and land value costs. Various complications result, particularly estimating the stream of expected benefits which is the focus of this report. From the theoretical model developed and a review of relevant literature, it was concluded that subject to problems caused by externalities, benefits of flood plain protection can be appropriately measured by direct estimation or by examining changes in site values of affected areas. To develop this general equilibrium locational model, two methodological studies using locational measures, INTASA-and Weisz, are reviewed and the empirical techniques applied to their methodologies are criticized. Having a similar conceptual model which uses changes in land values in the final analysis, both models have serious shortcomings: Misspecification of land value equation, inability to measure social and environmental effects, biased population projections and lack of consideration for alternative land uses. A regression model of the effect of flood risk on land values developed with St. Louis area data seems to deal with some of these problems. Research is necessary to develop techniques and models for determining land values. (Salzman-North Carolina)
W76-01595

WASHINGTON'S WATERFRONT LESSON,
North Carolina Univ. at Chapel Hill. Dept. of Fine Arts.
S. J. Makler.
Water Spectrum, Vol 6, No 4, p 21-28, Winter, 1974-75. 11 fig, 6 ref.

Descriptors: *City planning, *Area redevelopment, *Political aspects, *Social aspects, *Psychological aspects, *District of Columbia, Economic justification.
Identifiers: *Waterfront Renewal Project, Washington channel, National Capital Planning Commission, Washington D.C.

This article examines the urban waterfront renewal project in Washington, D.C., pointing out the need to remove blight with caution before resorting to razing and rebuilding. The opposing banks of the Washington channel reflect two diverse land uses: a wooded peninsula on the east and a modern urban complex complete with restaurants, motels, shops and upper-income residences on the opposite side. Authorized by Congress and the National Planning Commission, developers and a non-profit corporation of prominent local citizens planned to revitalize the west bank which, although not deteriorating had a backwater look which was not good enough to be a showcase for the new Southwest. Political and financial interests prevailed with little consideration to neighborhood merchants and residents. The process of renovating the waterfront began with high ideals and grandiose designs coupled with an unclear concept of what should be done. The project evolved in an atmosphere of confusion and compromise between developers and local residents which restricted alternatives. The renewal seems nothing more than a face-lift at a considerable cost which includes expensive flood control and fewer expected revenues from low-density development. The area is more accessible to the public and tourists, and more organized and new in appearance, yet the color, charm and character of the old waterfront are lost. (Salzman-North Carolina)
W76-01596

TOWARDS SYSTEM MODELS FOR WATER RESOURCE MANAGEMENT--A COMMENT,
Department of the Environment, London (England). Systems Analysis Research Unit.
For primary bibliographic entry see Field 6A.
W76-01603

SCHEDULING MAJOR CAPITAL EXPENDITURES TO MINIMIZE COSTS,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 6C.
W76-01604

HENRY GEORGE, PROPERTY RIGHTS AND ENVIRONMENTAL QUALITY: CLASSICAL ANSWERS TO 'NEW' PROBLEMS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 5G.
W76-01614

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01616

FUTURE WATER POLICIES,
Soil Conservation Service, Washington, D.C. River Basins.
For primary bibliographic entry see Field 6E.
W76-01617

THE CONCEPT OF WATER RESOURCES DEVELOPMENT,
Central Water and Power Commission, New Delhi (India).
J. P. Naegamvala.
Indian Journal of Power and River Valley Development, p 6-12, January 1973. 1 tab, 6 ref.

Descriptors: *Water resources development, *Asia, Optimal development plans, Water supply, River basin development, Water storage, Interbasin transfers, Water demand.
Identifiers: *India.

To illustrate the present stage of India's water resources development and to visualize future possibilities, five parameters--the percentage of gross water resources developed, per capita culturable land available, percentage of cultivatable area irrigated, irrigation intensity and per capita water made available are given for each river basin. Based on per capita water made available, irrigation intensity, and percentage of agricultural area irrigated, the Indus basin is the most developed. But in terms of optimum water use, this region has great potential of improving the irrigation efficiency not only of water use and productivity but also to enable diversion to adjoining dry areas in Rajasthan without detrimental effects. The Brahmaputra basin is the most underdeveloped in the country but flood protection overrides other developmental aspects. The Brahamaputra basin waters, when controlled for generation of power and mass trans-basin diversion, will control the destiny of India beyond 2000 A.D. Basin-wide studies of population growth show the urgent need to achieve better water distribution through inter-basin transfers, conjunctive use of surface and groundwaters, etc., with priorities in individual regions. Simultaneously, the need for water conservation by evaporation suppression, better management, and improving supply efficiency for demand-based performance is also indicated. (Auen-Wisconsin)
W76-01618

A RATIONALE FOR A CORPORATE AIR POLLUTION ABATEMENT POLICY,
California Univ., Riverside.
For primary bibliographic entry see Field 5G.
W76-01619

ENERGY--ENVIRONMENT.
Ballinger Publishing Co., Cambridge, Mass.
1975 Current Publications. 16 p.

Descriptors: *Energy, *Environment, *Publications, Law of the Sea, Taxes, Electric power, Pricing, Fuels, Financing, Land reclamation, Transportation, Air pollution, Highway deicing, Water pollution, Oil spills, Regulation.

A complete listing of books published by this company for the Energy Policy Project of the Ford Foundation, together with summaries of their contents is presented. The titles include: A Time to Choose: America's Energy Future; Perspective on Power: A Study of the Regulation and Pricing of Electric Power; Oil Spills and the Marine Environment; Energy, Taxes, and Subsidies; Studies in Energy Tax Policy; Studies in Electric Utility Regulation; Competition in the U.S. Energy Industry; Energy Prices 1960-73; Energy Policy-Industry Perspectives; Potential Fuel Effectiveness in Industry; Financing the Energy Industry; U.S. Energy Research and Development Policy; Energy and Agriculture in the Third World; Energy Consumption in Manufacturing; Rehabilitation Potential of Western Coal Lands; The American Energy Consumer; New Energy Technologies for Buildings: Institutional Problems and Solutions; The Energy Conservation Papers; Nuclear Theft; Energy and U.S. Foreign Policy; Hazards of Maritime Transit; and Global Marine Attributes. Sixteen other titles deal with legal problems of the ocean and environmental and urban economics. (Auen-Wisconsin)
W76-01620

THE ECONOMICS OF THE WEST COAST OIL SPILL CLEAN-UP INDUSTRY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W76-01624

SOME NEW APPROACHES TO SOLVING URGENT PROBLEMS IN THE THEORY AND PRACTICE OF HYGIENIC STANDARDS FOR INJURIOUS SUBSTANCES ,
For primary bibliographic entry see Field 5G.
W76-01659

INSTITUTIONAL BEHAVIOR CONCERNING RIVER BASIN MANAGEMENT LEGISLATION,
Doane Coll. Crete, Nebr.
For primary bibliographic entry see Field 6E.
W76-01682

SALT RIVER PROJECT ANNUAL REPORT, 1974.
Salt River Project, Phoenix, Ariz.
1974, 26 p, 14 fig, 13 tab.

Descriptors: *Water resources, *Electric power production, *Water utilization, *Water management(Applied), *Water resources development, Hydroelectric plants, Power marketing, Electric power costs, Electric power demand, Hydrology, Planning, Water supply, Water allocation(Policy), Water demand, Water requirements, Water distribution(Applied), Arizona, Water delivery, Surface waters.
Identifiers: *Salt River Project, Salt River(Ariz), Verde River(Ariz)

The Salt River Project is comprised of the Salt River Project Agricultrual Improvement and Power District, which provides electric service to residential, commercial, industrial and agricultural power users in a 2,900 sq mile area in parts of Maricopa, Gila, and Pinal counties in Arizona, and the Salt River Valley Water Users' Association, which administers water rights of the Project's 250,000-acre area and operates and maintains the irrigation transmission and distribution system which provides water for agriculture, municipal and industrial uses. For the year 1974, total water demand remained relatively constant, but city demand for water increased from 152,626 acre-ft in 1973 to 160,342 acre-ft in 1974 and the number of electric customers increased from 225,921 to 239,431 from 1973-1974. For 1974, operating revenues totaled $169,585,165 and net revenues reached $8.8 million. Total water use decreased from 895,886 acre-ft in 1973 to 710,723 acre-ft in 1974. (Robinett-Arizona)
W76-01704

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ., Tucson. Div of Economic and Business Research.
H. J. Frank.
Arizona State Fuel and Energy Office, February 1975, 108 p, 10 fig, 41 tab, 24 ref, 5 append.

Descriptors: *Electric power production, *Hydroelectric plants, *Planning, *Arizona, *Electric powerplants, Water resources, Water utilization, Water resource development, Electric power demand, Surface waters, Electric power, Thermal powerplants, Hydroelectric power, Pumped storage, Water utilization.
Identifiers: Energy resources.

The contribution which Arizona's energy resources currently make toward meeting the energy requirements of the state is limited to hydroelectric power and coal. Known deposits of crude oil, natural gas, and uranium are scattered and small, and information on these sources, as well as coal, is inadequate. Energy demand projections indicate that consumption in 1985 could be as much as two and one half time the 1973 level if the historical growth trend continues. There are 12 existing hydroelectric generating sites in Arizona which contributed 11 percent of the state's energy in 1973. These 12 dams have a total of 51 generating units, with a total generating capacity of 3010 megawatts of which about 875 megawatts are available to Arizona (this represents 1.5 percent of the total installed hydroelectric capacity in the United States). There are 18 potential sites for new hydroelectric facilities in the state. No estimates are available of the number of units or the total capacity at 10 of the sites, but the remaining 8 sites could be suitable for a total of approximately 40 generating units with a total capacity of over 17,000 megawatts, or five times the capacity of current units. (Robinett-Arizona)
W76-01709

ENERGY DEVELOPMENT IN THE ROCKY MOUNTAIN REGION: GOALS AND CONCERNS.
Federation of Rocky Mountain States, Inc. Denver, Colo.
July, 1975. 134 p, 7 fig, 20 tab, 36 ref.

Descriptors: *Rocky Mountain Region, *Water utilization, *Electric power production, *Environmental effects, *Planning, Arid lands, Electric powerplants, Hydroelectric plants, Water resources, Social aspects, Water requirements, Economics, Legal aspects, Land resources, Water conservation, Administration, Water law.
Identifiers: *Energy development, Regional energy statements.

This report is composed of 3 parts: the first contains 3 regional energy statements; the second is a summary of data currently in use by state, federal and private business officials and attempts to define the region's energy sources and how the development will affect the states in the Rocky Mountain West with respect to water resources, and environmental and social aspects; the third part consists of a group of background documents on energy development issues, and includes papers on economic effects, social problems, balancing resource development with environental protection, state responsibilities, the federal government and industry, legal questions and alternatives, and a review of federal energy research and development policy. Most noncontroversial hydroelectric sites have already been develop[ed] in the West, and those that are underdevelope[d] of great environmental value. Limited [water] resources call for greater care in the locati[on] plants, the selection of extraction, production [and] conversion processes, and the choice of p[ower] transport and waste treatment systems [that] would be required in less arid regions. (Rob[inett]-Arizona)
W76-01710

SUMMARY OF 1975 ROCKY MOUN[TAIN] LAND USE AND NATURAL RESOURCE BI[LL] OF INTERESTS.
Federation of Rocky Mountain States, [Inc.] Denver, Colo.
For primary bibliographic entry see Field 6E.
W76-01711

THE ROCKY MOUNTAIN REGION: A U[RGENT] OF INTERESTS.
Federation of Rocky Mountain States, [Inc.] Denver, Colo.
October, 1975. 128 p, 80 tab, 42 ref.

Descriptors: *Rocky Mountain Region, *Na[tural] resources, *Water resources, *Plan[ning], *Agriculture, Arizona, Colorado, Idaho, Mon[tana], Nevada, New Mexico, Utah, Wyoming, W[ater] conservation, Water utilization, Land resou[rces], Recreation, Water requirements, Arid lands, [Soc]ial aspects, Economics, Transporta[tion], Forestry, Land use, Urbanization.

This publication represents a source of info[rma]tion for the Rocky Mountain Region (incl[uding] Arizona, Colorado, Idaho, Montana, Nev[ada], New Mexico, Utah, and Wyoming), with re[gard] to natural resources, human resources, transp[or]tation, market development, telecommunicat[ions], housing and community development, agricul[ture] and the arts and humanities. The na[tural] resources, water needs and projects, and f[uture] plans of each state are discussed. Statistics in [the] following categories are given for each s[tate]: agriculture, water, energy and minerals, land[use] and ownership, forestry, grazing land, out[door] recreation, and socio-economics. Water need[s] agriculture and municipal use are increasing [while] the region remains the driest area in the U[nited] States. A large percentage of the water iused i[n] irrigation, and if new water needs are not met [the] agricultural industries will suffer first. (Robi[nett]-Arizona)
W76-01712

STAGE 1 DEVELOPMENT OF THE SHO[ALH]AVEN SCHEME-I.
Snowy Mountains Engineering Corp., Co[oma] (Australia).
Water Power and Dam Construction, Vol 27 [No] 8, p 275-282, August, 1975. 4 tab, 9 fig.

Descriptors: *Sewerage, *Water supply, *Ele[ctric] power, Dams, Construction, *Australia.
Identifiers: Catchments.

The Shoalhaven scheme, divided into three sta[ges], is being developed in order to increase safe s[ew]erage and supply system draft. It is headed [by] the Sydney Metropolitan Water Sewerage [and] Drainage Board (the Board) and by the Electr[icity] Commission of New South Wales (the Com[mis]sion). Facilities for phase 1 of stage 1 are discu[ssed] in detail. The Shoalhaven was chosen becau[se] it was the only catchment potentially able to m[eet] the Board's requirements up to the year 2[000]. Stage development was advised in order to cu[mu]latively increase the safe draft of the total sys[tem] of 340M1/day by 1975, 1250M1/day by 1982, [and] 2140M1/day by 2000. Stage 1 is functionally [di]vided into two projects: the Kangaroo-Fitz[roy] project which includes all works from the Tall[ong]a dam north to the Fitzroy Falls reservoir and w[hich] is involved in pumping capacities; and. the [Ya]rrawang-Wingecarribee project which include[s all]

s north of Fitzroy Falls reservoir that transfer
ed Shoalhaven water into the Nepean and
ndilly catchments and which will include the
ng of a dam. Operational and dimensional
or the various dams are shown in the tables.
ain features of the scheme comprise the Tal-
dam, the Bendeela power station, the
eela pipeline, the Bendeela pondage, the
aroo Valley facilities, and the Fitzroy canal
itzroy Falls dam. (Waltner-FIRL)
01732

VER SEEKS TOMORROW'S WATER
AY,
ns, Brinckerhoff, Quade and Douglas, Inc.,
York.
rimary bibliographic entry see Field 4A.
01779

NSYLVANIA USES CREATIVE APPROACH
WATER QUALITY MANAGEMENT
NNING,
sylvania Dept. of Environmental Resources,
isburg. Environmental Protection and Regula-
rimary bibliographic entry see Field 5G.
-01796

IONAL INSTREAM FLOW NEEDS IN THE
IFIC NORTHWEST: AN ANALYSIS OF IN-
UTIONAL, LEGAL, AND TECHNOLOGI-
ASPECTS OF ALLOCATION PROCESSES
LIMITED STREAMFLOW,
hington State Water Research Center, Pull-
. Doerksen, J. F. Orsborn, F. D. Deane, and
. Lamb.
lable from the National Technical Informa-
Service, Springfield, Va 22161 as PB-247 424,
) in paper copy, $2.25 in microfiche. Report
0, April 1975. 177 p, 3 fig, 25 tab,500 ref, 4 ap-
l. OWRT C-5344(4241)(1).

riptors: *Regional analysis, *Pacific
hwest U.S., Institutions, Legal aspects,
nology, *Streamflow, *Water alloca-
Policy), Low flow, Competing uses, Political
cts, Methodology, Flow.
tifiers: *Instream flow needs, Minimum
s, Information transfer.

stigation was conducted into the legal, politi-
and technological aspects of the process of
rmining stream flow requirements for various
, and establishing and preserving those flows.
ough the term 'methodology' is usually as-
ed to imply 'technical methodology,' many
edural steps, from the time of recognition of
for the preservation of flow in a stream to the
of flow establishment, are really parts of the
hodology.' Instream flow methodology should
considered as a water resource allocation
ess which includes: technological determina-
s of needs for the instream and out-of-stream
; flow recommendations and decisions in the
l-politcal arena; establishment of flow levels
er the law; and, maintenance and monitoring
he reserved flow or flows. Contacts were ini-
y established through several workshops con-
ed under an earlier project and through
stionnaires on the legal, political, and technical
cts of the problem. The questionnaires were
to various state and federal agencies in Utah,
gon, Washington, Idaho, Montana, Wyoming,
Colorado. Personal interviews with many
icy personnel were used to explore details of
agency programs and their methodologies.
-01797

EFITS AND COST OF DRAINAGE
TEMS,
lue Univ., Lafayette, Ind. Dept. of Agricul-
l Economics.
M. Naber, and W. L. Miller.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 412, $5.00 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center Technical Report No 65, August 1975. 88 p, 14 fig, 7 tab, 48 ref, append. Partial Completion Report. OWRT C-3277(3713)(8).

Descriptors: *Urban drainage, *City planning, *Community development, *Cost-benefit analysis, *Economic rent, Drainage systems, Urban runoff, Urbanization, Economics, Decision making, Cost comparisons, Cost-benefit ratio, Costs, Benefits.

A method is proposed for estimating the benefits and costs of providing adequate urban storm drainage facilities. This kind of information is essential for planners and decision makers for urban development. The concept of economic rent was used in the development of the model. For example, economic rent was condidered the increase in selling price of a residence due to the provision of adequate storm drainage facilities. The cost to provide the drainage system is equal to the expected loss in economic rent. Also involved was estimating and comparing the benefits and costs of providing storm drainage in an area prior to urbanization with the benefits and costs of providing storm drainage in an area where urbanization was complete. Results in the case studies used indicated that cost of installing adequate storm drainage facilities in an residential area was greater than the benefits derived. This conclusion did not take into account the value of damages accrued by other members of society as inconvenience of detouring flooded streets, street damage, etc. A comparison of the benefits and costs of providing storm drainage prior to urbanization resulted in a favorable ratio. Although the case study limits the applicability of the results, a similar approach to evaluate the benefits and costs of a storm drainage system can be used for other areas. (See also W76-01799) (Wiersma-Purdue)
W76-01798

STOCHASTIC MODELS FOR GROUND WATER LEVELS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W76-01799

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART I, EFFECT OF THE 'REVIEW AND COMMENT PROCESS' ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE,
Stanford Univ., Calif. Dept. of Civil Engineering.
W. W. Hill, and L. Ortolano.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 433, $7.75 in paper copy, $2.25 in microfiche. EEP-Report No 52, September, 1975. 208 p, 5 fig, 15 tab, 55 ref, 2 append. Partial Completion Report. OWRT-C-4080(9017)(1).

Descriptors: *Environmental effects, *Project planning, *Administrative decisions, *Attitudes, *Administrative agencies, *Institutions, Social aspects, Water resources development, Small watersheds, Soil conservation, United States, Federal government, Institutional constraints.
Identifiers: *National Environmental Policy Act of 1969, *Environmental impact statement, *Soil Conservation Service, *Army Corps of Engineers, *Interagency coordination, Public involvement, Agency regulations, Council on Environmental Quality.

The review and comment (R and C) process refers to the circulation of environmental impact statements (EIS), and earlier informal versions thereof, to agencies and publics for review and comment pursuant to the requirements of section 102 (2) (C) of the National Environmental Policy Act of 1969 (NEPA). This report examines the effect that this process has had on Corps of Engineers pre authorization studies and Soil Conservation Service small watershed planning. The ways in which the R and C process might be used in attaining NEPA's policy objectives form the framework for the analysis which systematically examines: how the R and C requirements have been integrated into the Corps and SCS planning processes, the extent to which coordination has increased, the usefulness of the information obtained and the extent to which this information has influenced agency decision making. Data obtained from 242 questionnaires completed by planners in every Corps District and SCS State Office show that coordination with other agencies and publics has increased, though the respondents' perceptions of the utility of the information obtained as a result of this is mixed. One very significant finding is that the R and C process has forced planners to give more serious consideration to suggestions made by other agencies. However, the effect on final decisions appears to be limited because the R and C process is not begun until quite late in the planning process. Obstacles to an effective R and C process are discussed. (See also W76-01801)
W76-01800

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA,
Stanford Univ., Calif. Dept. of Civil Engineering.
J. Randolph, and L. Ortolano.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 434, $8.00 in paper copy, $2.25 in microfiche. EEP-Report No 53, September, 1975. 228 p, 11 fig, 8 tab, append. Partial Completion Report. OWRR-C-4080(9017)(2).

Descriptors: *Environmental effects, *Project planning, *Multiple purpose projects, *Administrative decisions, *California, Water management(Applied), Attitudes, Social aspects, Feasibility studies, Institutions, Water resources development, Flood control, Water supply, Federal government.
Identifiers: *National Environmental Policy Act of 1969, *Environmental Impact Statements, *Army Corps of Engineers, *Interagency coordination, Statislaus River(California), Carmel River(California).

Two case studies were employed to examine the '102 process'; i.e., the procedures followed by federal agencies in the implementation of section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA). The effectiveness of the 102 process in integrating environmental factors in planning was analyzed. The approach relied on written documentation and personal interviews to provide an historical analysis of factors relevant to decision making in the context of the case studies. The Sacramento District's planning of the New Melones project on the Stanislaus River illustrates NEPA's influence in a situation where much of the planning occurred prior to NEPA's passage. NEPA's influence was limited to bringing about project modification features. The San Francisco District's planning in the Carmel River Basin was conducted after the passage of NEPA. In this case, the 102 process had little influence on the types of alternatives examined and on the determination of project size. The process did, however, have some influence on the introduction of project mitigation features. For the 102 process to be effective in implementing NEPA's policy goals, much more attention must be given to the implementation of sections 102(2)(A) and 102(2)(B) of NEPA. (See also W76-01800)
W76-01801

ECONOMICS OF WATER SUPPLY PLANNING AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. C. Frey, H. B. Gamble, and O. H. Sauerlender.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 560, $6.75 in paper copy, $2.25 in microfiche. Research Publication No 90, June 1975. 145 p, 56 tab, 8 fig, 5 append, 50 ref. OWRT C-3119(3688)(1).

Descriptors: *Droughts, *Cities, *Northeast U.S., *Water demand, Cost analysis, Elasticity of demand, Return to scale, Planning, Water management(Applied), Water supply, Water districts, Pricing.
Identifiers: *Water utilities, *Special water districts, *Shortage, *Water pricing.

A sampling of medium-sized cities in the Northeastern United States provided data and information useful in understanding the organization and management of municipal water utilities. The following objectives were pursued: (1) identification and description of political, demographic, systemic and economic characteristics of water utility systems that account for differential response patterns to shortage situations; (2) development of an index for evaluating the capacity of water supply systems to accommodate potential demands; (3) development of a cost function to determine whether economies of scale can be exploited in developing systems capable to avoiding drought shortages, and (4) estimation of the elasticity of residential demand for water to determine the feasibility of alleviating the consequences of drought by flexible pricing. A regression analysis was undertaken to ascertain the impact of selected variables on the supply-use ratios of the sampled utilities. Ownership patterns, the proportion of water used for residential purposes, variability in consumption requirements, and population density were the most significant factors. The long run elasticity of residential demand for water was approximately -0.20. In effect, a ten percent increase in price would probably reduce consumption only two percent. (Sink-Penn State)
W76-01802

CAPACITY OF WATER-BASED RECREATION SYSTEMS, PART III: METHODOLOGY AND FINDINGS,
North Carolina State Univ., Raleigh. Dept. of Recreation Resources Administration.
H. K. Cordell, G. A. Hammon, J. Graham, W. L. Hafley, and M. R. Warren.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 557, $5.50 in paper copy, $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No 90, September 1975. 109 p, 3 tab, 27 fig, 4 exhibits. OWRT B-013-NC(5). 14-01-0001-1936.

Descriptors: *Recreation demand, *Recreation facilities, *Boating, *Water skiing, *Swimming, Water sports, Water zoning, Model studies, Aerial photography, *North Carolina, Planning, Methodology.
Identifiers: Recreation capacity, Recreation planning, *Lake Burlington(NC).

This is the third of a series of publications reporting on research to develop methods, models, and guidelines for planning and managing water-based recreation systems. The previous reports are: Capacity of Water-Based Recreation Systems: Part I, The State of the Art - Gordon A. Hammon, Harold K. Cordell, et al, (April 1974) and Capacity of Water-Based Recreation Systems: Part II, A Systems Approach to Capacity Analysis - Gordon A. Hammon, Harold K. Cordell, et al, (July 1974). (See W74-07719 and W74-12364). In this report, methods conceptualized and tested for collecting and processing data describing recreational boating behavior are presented. The test site was Lake Burlington in the Piedmont of North Carolina. Means for data collection included questionnaires, interviewing, shoreline-based observation, and aerial photography. Based on an analysis of the interview and on-site observation data a major finding is that capacity, measured as number of boats which should use a lake system at the same time, probably should not be fixed by the managing authority. Boaters at the study site appeared to have acclimatized themselves to the frequently heavy use conditions which sometimes exceeded 1 boat per 6 acres of water surface. Thus managers and planners' continual for the magic number called capacity, which if found and used is believed to be the solution to many management problems, appears to be an unnecessary pursuit. (Stewart-North Carolina State)
W76-01804

AN INNOVATIVE ORGANIZATIONAL ARRANGEMENT FOR COMPREHENSIVE WATER SERVICES: THE THAMES WATER AUTHORITY AS A MODEL FOR COMPLEX AREAS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W76-01815

DETERMINATION OF THE NUMBER OF COMMERCIAL AND NONCOMMERCIAL RECREATIONAL BOATS IN THE UNITED STATES, THEIR USE, AND SELECTED CHARACTERISTICS,
K. M. Bromberg.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11186, $5.50 in paper copy, $2.25 in microfiche. Report No NOAA-74051407, December 1973. 116 p, 3 append.

Descriptors: *Marine fish, *Boats, Sport fishing, Estimating, Statistical methods, Recreation, Saline water fish, Marine fisheries, Surveys.
Identifiers: *Salt water fishing.

To measure the impact of both commercial and noncommercial recreational boats in salt water fishery resources (the estuarine and ocean environment), the National Marine Fisheries Service must have current, accurate information. The findings of a survey research effort to determine the number of commercial vs. noncommercial recreation boats that fish in salt water, and the species sought by these boats is reported. Twenty-eight sampling units of noncommercial salt water sport fishing were created throghout the U.S. according to geographic proximity to salt water. Random telephone calls, distributed in the 28 sampling units according to the number of state licensed boats, were made with 941 of 9939 household respondents reporting that their household owned one or more boats. Estimates of (1) the number of private recreational salt water fishing boats, (2) the number of trips and days used per 12 months, and (3) species of fish sought are made. Commercial salt water fishing boats were sampled from listings of commercial sport fishing vessels with 159 of 163 operators of commercial recreational vessels responding. The number of boats, trips and days used in 12 months, fish species sought and annual gross revenue are estimated for all commercial salt water sport fishing vessels from these responses. (Becker-Wisconsin)
W76-01817

PLANNING WATER RESSOURCES DEVELOPMENT.
Economic Commission for Asia and the Far East (UN), New York.
Available from U.N. Sales Office, New York or Geneva, for $2.50. Report of the Working Group of Experts on Water Resources Planning, Bangkok, August 29-September 9, 1968, Thailand. United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, (August 1969). 135 p, 4 fig, 3 tab.

Descriptors: *Water resources developm *Asia, *Comprehensive planning, *Internati commisions, *United Nations, Decision mak Prices, Standards, Financing, Discount rates, rigation, Project life, Project purposes, Intang benefits, Flood control, Multiple-purpose jects, Inland waterways, Income distribut Economic efficiency, Water supply, Hydroe tric power, Government finance, Psycholog aspects, Agriculture, Training, Financial feas ty, Economic impact, Evaluation, Interest ra Project benefits, Costs, Social aspects, Pro planning.
Identifiers: *Far East, *Project evaluation.

Prepared background papers and ensuing dis sions are presented for four sub-headings of ject matter from the joint meeting of the Econo Commission for Asia and the Far East (ECA and the United Nations Office of Techn Cooperation. This Working Group of Expe which met at Bangkok, Thailand in 1968, inclu representatives from 19 member countries, inc ing the USSR and the U.S. Under the topic procedures and standards for the economic financial analysis of water resources planning, definitions and applications were presented for concepts of opportunity cost, shadow price, terest rate, indirect tax, period of analysis and ject costs. Other background papers in this discussed the topics of irrigation developm costs at the farm level and the criteria used economic evaluation. Papers on social and economic, and social and economic considerati in water resources projects raised top questions ranging from planning and adminis tion to mobilizing public support. The coordina of various agencies covering water resou development and related fields, and other siderations important to the long range future water resources development are discussed. general conclusions and recommendations f the final sessions of the Working Group are cluded. (See also W76-01819 thru W76-018 (Becker-Wisconsin)
W76-01818

MEASUREMENT STANDARDS FOR PROJE EVALUATION--PRICES AND INTEREST THE ECAFE SECRETARIAT.
In: United Nations Economic Commission Asia and the Far East, Water Resources Series 37, p 23-34, 4 tab.

Descriptors: *Project planning, *Evaluati *Methodology, Cost-benefit analysis, Inte rates, Discount rates, Prices, Inflation(Econom Risks, Asia.
Identifiers: *Market prices, *Shadow price.

The procedure to be followed in assigning pri and interest rates to physical resources involve a project (so that the benefits and costs of a p ject may be evaluated) is outlined. It is reco mended that market prices be used generally, the correct shadow prices should be used alter tively in those cases where market prices wo cause divergencies of crucial importance in dec ing a project's worth. Ambiguities arising from direct taxes and foreign trade tariffs are to resolved by using prices net of taxes in the form case and international prices in the latter. So average yield on longterm government bonds recommended as the correct interst rate, w noted exceptions. Discounting methods are m tioned. The effects of price changes independ of and resulting from the project on the valuati of the project are considered. Inflation genera must be ignored, especially if changes in relat prices do not occur. Cost-benefit analysis, wh both public and private participation are ticipated, should be carried out under two assum tions: (1) that private participation is forthcomi (2) that private participation is unavailable and t part of the project involving such participation w have to be shelved. The role of risks and unc tainties is analyzed. (See also W76-01818) (Beck Wisconsin)

-01819

JECT COSTS.
United Nations Economic Commission for
and the Far East, Water Resources Series,
7, p 35-41. 1 fig, 1 tab.

criptors: *Costs, *Evaluation, *Project
ning, *Estimated costs, Annual costs, Esti-
ng, Cost allocation, Capital costs, Right-of-
, Construction costs, Replacement costs,
rating costs, Maintenance costs, Asia.
tifiers: Resettlement costs.

ect costs are defined as the sum of all expendi-
s required to realize project objectives.
ects of costs estimation from both pre- and
-construction bases are discussed. Actual pro-
costs are determined only after a project has
completed and the accounting books closed.
mates of costs for planning purposes are
lly divided into three classes: (1) reconnais-
e estimate--prepared using already available
in order to get an initial judgement of the
bility of a project for further feasibility stu-
; (2) feasibility estimate--follows a positive
ement on the reconnaissance estimate and
more detailed and specific data in order to
the basis for authorization of a project; (3)
nite plan or pre-construction estimate--based
lata obtained for final designs and specifica-
s prior to letting out construction contracts.
ous components of capital costs are discussed
ore detail: costs of land and rights-of-way,
ulation resettlement, construction costs, farm-
elopment costs and annual costs. Specifically,
truction costs include field costs, engineering
design costs, administrative costs, investiga-
al costs, and interest. An annual cost figure is
lly used as a common basis for comparing
ect benefits and costs which occur at different
s during the life of the project. (See also W76-
8) (Becker-Wisconsin)
5-01820

IGATION DEVELOPMENT COSTS AT THE
M LEVEL.
d and Agriculture Organization of the United
ions, Rome (Italy).
United Nations Economic Commission for
a and the Far East, Water Resources Series No
p 43-57. 7 tab.

criptors: *Project planning, *Costs, *Irrigation
grams, *Water distribution(Applied), Asia,
m units, Irrigation efficience, Government
ports.

erience has demonstrated that the costs of ir-
tion projects at the farm level should be con-
red in project costs in order to avoid serious
ys of project benefits. Successful farm-
elopment measures in conjunction with irriga-
projects depend on: (1) careful water distribu-
to each farm plot; (2) land reform and con-
dation of small plots; (3) active well-supported
earch and extension programs; (4) credit provi-
s for fertilizers, improved seeds and pesti-
s; and (5) well informed and organized farmer
ociations. In order to evaluate the success of
n output stimulation programs all costs need to
dentified and evaluated. These costs can be di-
ed into (1) service area development cost--the
ts of making water available at the boundary of
l area; (2) farm development costs--including
major items of land leveling and smoothing,
l preparation, and drainage; (3) government
port costs--those costs for services and
stance that the government needs to furnish to
area in order to improve farm production and
farmers' standard of living and to secure return
n investment. Farmers' attitudes and coopera-
in operation and maintenance of irrigation
tems is considered as a factor in irrigation
elopment costs. (See also W76-01818) (Becker-
sconsin)
6-01821

IDENTIFICATION AND MEASUREMENTS OF ECONOMIC PROJECT BENEFITS.
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, p 58-70.

Descriptors: *Evaluation, *Project benefits, *Economic impact, *Water resources development, Irrigation, Flood control, Hydroelectric power, Navigation, Water supply, Watershed management, Measurement, Asia, Direct benefits, Indirect benefits, Fringe benefits, Alternative planning, Recreation.

The economic benefits of a project are represented by the increase in the value of the output goods and services stemming from the project and are measured by their quantities and their market prices. Definitions of primary, secondary, and national project benefits and associated costs are provided. The benefits of water resources projects are identified on the basis of the need for development; principles and assumptions involved in the measurement of benefits are discussed; procedures of measurement of benefits are described; and limitations of the application of present valuation techniques are pointed out. The reliability of benefit measurement depends on conditions which vary from country to country: available knowledge about the project's future; projection of future conditions; and the measurement techniques applicable and selected. Seven project-types are discussed in terms of evaluation techniques, primary and secondary benefits, and demand for the project-type. They are irrigation, flood control, hydro-power, navigation, public water supply, recreation, and watershed management. Limitation of the present knowledge concerning benefit measurement includes incomplete information on input and output; biased projection techniques; nonuniformity of the standard of value among beneficiaries, and the necessity of considering other measures in planning decisions. (See also W76-01818) (Becker-Wisconsin)
W76-01822

CRITERIA OF ECONOMIC EVALUATION IN WATER RESOURCES DEVELOPMENT.
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, p 71-80.

Descriptors: *Project planning, *Water resources development, *Economic impact, *Evaluation, Economic efficiency, Income distribution, Project benefits, Costs, Welfare(Economics), Gross National Product, Asia, Cost-benefit ratio.

Goods and services from multipurpose water resources projects are diverse in nature, meeting various needs and desires of the people which may also be met by alternative means. In order to make a comprehensive assessment of the effectiveness and efficiency of water resources projects in attaining the ultimate societal goals, various evaluations from different viewpoints have to be made. Goods and services produced by water resources projects can be classified into three categories: (1) incidental benefits--for which no substantial costs are incurred in their production; (2) goods and services produced without conflict with other possible uses; (3) goods and services produced in conflict with other uses. The objectives of economic evaluation of water resources projects include: the determination of the functions to be included in the project and the optimum scale of development for each function, the examination of the effectiveness and efficiency of each alternative plan of a project in meeting economic, social, and political goals, and the provision of economic data to establish cost allocation. Economic efficiency criteria and redistribution of income criteria are discussed on theoretical and applied bases. Benefit-cost, rate of effectiveness, and minimum cost criteria are examined individually. (See also W76-01818) (Becker-Wisconsin)
W76-01823

FINANCIAL ANALYSIS.
In: United Nations Economic Commissions for Asia and the Far East, Water Resources Series No 37, p 81-99. 17 tab.

Descriptors: *Water resources development, *Financing, *Return(Monetary), Loans, Debt, Interest, Reimbursable costs, Non-reimbursable costs, Cost repayment, Amortization, Asia.
Identifiers: *Financial analysis, Foreign loans.

The development of water resources entails the creation of lasting physical assets, at the same time, because development can seldom be financed out of revenue, it mortgages the future. The financial analysis of a proposed development project serves to demonstrate that the project can be financed in such a way that the costs of development can be repaid out of direct monetary returns accruing to the project during the maturity of the loans raised to finance it. The financial analysis includes only the direct monetary returns or revenues and spans the terms to maturity of the loans. It allocates the total financial cost to various beneficiaries and assesses how much they should pay. Local and foreign indebtedness, government subsidies, reimbursable and nonreimbursable costs, and repayment schedules are discussed in terms of their application to and their considerable impact on the financial analysis. Also discussed are: (1) project costs--entering the financial analysis as either capital costs or operations maintenance and replacement costs; (2) the financing of the foreign-exchange and local-currency components; (3) and repayment capcity. Two comprehensive examples of financial analysis are included. (See also W76-01818) (Becker-Wisconsin)
W76-01824

SOCIAL AND NON-ECONOMIC CONSIDERATIONS IN WATER RESOURCES PLANNING AND DEVELOPMENT.
In: United Nations Economic Commissions for Asia and the Far East, Water Resources Series No 37, p 100-123. 2 fig.

Descriptors: *Project planning, *Water resources development, *Social aspects, *Social participation, Institutions, Social impact, Social needs, Social change, Asia.

The improvement of social welfare is generally accepted as the essential, overriding purpose of planned development; so far, however, national planning and development in Asia have yielded very meager benefits. Levels of nutrition and housing are static or declining, while unemployment and underemployment remain chronic, and the distribution of national income seems to be becoming increasingly uneven and inequitable. This unfavorable and potentially explosive situation can be attributed partially to the sluggish pace of economic growth in Asia and to widespread neglect of social considerations in development planning. Lack of energetic public participation in national development efforts is one cause for the slow rate of development. Main elements in the promotion of dynamic social change are identified. Major program approaches that should be built into water resources development schemes in order to serve the objectives of productivity oriented income redistribution and promotion of massive popular support are discussed in terms of project evaluation, integrated agricultural and industrial development, and social services and allied programs. Also considered is the handling of social and noneconomic problems of water resources development in terms of policy-making and planning, integration of planning and fiscal policies, preparation of planning, administrative, and technical personnel, and research and evaluation. (See also W76-01818) (Becker-Wisconsin)
W76-01825

CO-ORDINATING THE ACTIVITIES OF ALL AGENCIES GOVERNING WATER RESOURCES DEVELOPMENT AND RELATED FIELDS.
In: United Nations Economic Commission for Asia and the Far East, Water Resources Series No 37, p 124-135.

Descriptors: *Administration, *Project planning, *Water resources development, Governmental interrelations, Inter-agency cooperation, Asia, Australia.
Identifiers: Taiwan, Indonesia, India, Iran, Japan, Laos, Malaysia, Nepal, Pakistan, Philippines, Singapore.

The countries of Asia and the Far East, with their agrarian populations and developing economies, consider water to be one of their principal resources and place much emphasis on its development and utilization. It is, therefore, important that there should be a well-considered and defined policy for the development of water resources of each region or basin, aiming at the use of water from all sources, for the greatest benefit of the people and compatible with the national plans for overall economic and social development. The preparation of basin plans or the development of other major water resources projects entails the collection, compilation, and analysis of a large mass of data and calls for cooperation and coordination among specialists in many fields. There must be a strong and competent organization to handle the coordination of the many activities. The roles of individuals, and of local, state, and national government and their agencies are explained. Examples of activities characteristically recognized as local, regional, or national responsibilities are given. The coordinating agencies are outlined for some of the ECAFE (Economic Commission for Asia and the Far East) countries: Australia, Ceylon, Taiwan, India, Indonesia, Iran, Japan, Laos, Malaysia, Nepal, Pakistan, Philippines, and Singapore. (See also W76-01818) (Becker-Wisconsin)
W76-01826

PERFORMANCE CONTROLS FOR SENSITIVE LANDS: A PRACTICAL GUIDE FOR LOCAL ADMINISTRATORS,
American Society of Planning Officials, Chicago, Ill.
For primary bibliographic entry see Field 6F.
W76-01871

WATER USE, SEMINAR DAMASCUS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 3F.
W76-01878

TRAINING AND EXTENSION FOR EFFECTIVE USE OF IRRIGATION WATER,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W76-01890

NEAR EAST APPLIED RESEARCH PROGRAMME FOR LAND AND WATER DEVELOPMENT,
Food and Agriculture Organization of the United Nations, Cairo (Egypt). Near East Regional Office.
For primary bibliographic entry see Field 3F.
W76-01891

WATER MANAGEMENT IN ONTARIO--AN ECONOMIC EVALUATION OF PUBLIC POLICY,
British Columbia Univ., Vancouver. Dept. of Economics.
R. S. Campbell, A. S. Pearse, and M. Uzelac.
Osgoode Hall Law Journal, Vol 12, No 3, p 475-526, 1974, 52 p, 165 ref.

Descriptors: *Economic efficiency, *Canada, *Watercourses(Legal aspects), *Water management(Applied), Administration, Water resources, Domestic water, Navigation, Riparian rights, Common law, Permits, Governmental interrelations, Foreign countries, Adoption of practices, Water conservation, Water supply development, Water law, Regulation.
Identifiers: Public policy, Available flow, *Ontario.

This essay examines, from an economic point of view, the efficiency of the complex framework of water law regulating water use in Ontario. There are two primary dimensions of water as a valuable resource. One is its physical quantity, which is useful in both 'withdrawal uses' such as domestic consumption and industrial processes and in 'in place uses' such as power generation and navigation. The scarcity factor, or 'available flow' can be augmented and regulated by various works. The other dimension of water is its capacity to absorb and disperse wastes. The scarcity factor in this dimension is referred to as the 'assimilative capacity' of the watercourse. It can also be augmented. Topics discussed concerning the available flow dimension include: legislative provisions; administration of the permit system; federal involvement; municipal and regional arrangements; and economic implications of flow allocation arrangements. Topics explored concerning the assimilative capacity include: common law doctrines; the discharge approval system; municipal-provincial arrangements; and the economic application of quality control arrangements. (Hoffman-Florida)
W76-01969

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A BARGAINING APPROACH FOR PROGRAMMING LEAST-COST WASTE TREATMENT ALONG A RIVER,
North Carolina State Univ., Raleigh. Dept. of Economics; and North Carolina State Univ., Raleigh. Dept. of Business.
For primary bibliographic entry see Field 5D.
W76-01504

READING USAC PROJECT: SEWER AND WATER ACCOUNTS PROCESSING COMPUTER PROGRAM, RELEASE NUMBER ONE, SOFTWARE,
Reading, Pa. USAC Project.
For primary bibliographic entry see Field 5G.
W76-01527

OPTIMAL PRICING AND INVESTMENT IN COMMUNITY WATER SUPPLY,
Tennessee Univ., Knoxville.
W. Goolsby.
Journal American Water Works Association, Vol 67, No 5, p 220-224, 1975. 6 fig, 20 ref.

Descriptors: *Water works, *Pricing, *Investment, Return to scale, Economies of scale, Costs, Water demand, Elasticity of demand, Model studies.
Identifiers: *Peak load pricing.

As the demand for water grows in the serviced area, the price of water should rise during periods of peak usage; the rise in price should be just large enough to equate the quantity demand with the quantity supplied. Based on the assumption that increases in demand can be correctly anticipated, the original plant will be built larger than required at the time of construction to allow for economies of scale in the production and distribution of water. This will result in that initially the peak price of water may be no more than marginal running cost. However at some point in time, th sum of charges exceeding marginal running co will begin to amortize the original fixed investmen plus those costs associated with waiting for th payment to be made. Two cycles of concern f water supplies are emphasized--the demand cyc and the envestment cycle. The response of wate prices to these cycles should be that rise with in creased demand, and that prices fall with increase in excess capacity, whether an increase in exce capacity occurs as the result of an expansion o the existing plant or a slackening of deman (Auen-Wisconsin)
W76-01600

DALLAS RATE SURVEY.
Dallas Water Utilities Dept., Tex.
Journal American Water Works Association, Vo 67, No 5, p 232-238, 1975. 13 tab.

Descriptors: *Surveys, *Water rates, Wate works, Alabama, Arizona, California, Colorado District of Columbia, Florida, Georgia, Hawai Indiana, Illinois, Iowa, Kansas, Kentucky, Mary land, Massachusetts, Michigan, Missouri, Min nesota, Nebraska, New Jersey, New York, Ne Mexico, North Carolina, Oklahoma, Ohio Oregon, Pennsylvania, Tennessee, Texas, Vi ginia, Washington, Wisconsin.
Identifiers: Dallas(Tex).

A 1974 water rate survey conducted by the Dalla Water Utilities, Texas, includes data for 62 util ties from cities in 28 states and the District o Columbia. All the utilities service areas where th urban population are in excess of 125,000. In add tion many service, either directly or indirectly areas beyond that of the inner city. One set of ta bles is concerned with the billing procedure an the second set gives data about charges. Th billing procedures include information on: Wate supply (ground, surface, or combination); syster municipally owned; penalty or discount, an amount, plus time period; delinquent meters be fore turn-off or other action; penalty charge for in sufficient fund checks; turn-on charges, by week day, evening, weekend, and holiday; service ca charges; transfer fee; deposit required for com mercial and residential installations; interest pai on deposit accounts; rate increase next year; per cent of increase; and date of last increase. The me tering data include monthly or semimonthl billing; minimum charge; quantity of water fo minimum charge; meter size for new charge revenue source; volume measurement (cu ft o gal); monthly meter residential rate by volume in crements; and percentage added for outside cit limits for retail service to residential customers (Auen-Wisconsin)
W76-01601

DREDGING COSTS: THEIR ESTIMATION ANI IMPLICATIONS TO THE MANAGEMENT O DREDGING OPERATIONS,
University of Wales Inst. of Science and Tech Cardiff. Dept. of Maritime Science.
R. J. Webb.
Dock and Harbour Authority, (U.K.), Vol 54, N 64, p 406-409, 1974. 2 fig, 6 tab.

Descriptors: *Dredging, *Costs, *Estimating *Harbors, Indirect costs, Direct costs, Cost allo cation, Depreciation, Economic life, Interes Operating costs.
Identifiers: Costing systems, NIVAG cost mode Inflation.

To measure the cost-efficiency of a harbo dredging operation and to provide a basis for pre dicting the effects of operation changes on cost-ef ficiency (emphasizing the level of direct costs an the distribution of costs of the various heads) thre costing systems are compared: (1) The traditiona financial account; (2) the 'NIVAG' cost mode which is used by many Dutch contractors fo building up their tender prices. It is designed t

redict rather than record costs, and only the perating costs are left for calculation from earlier ecords; and (3) opportunity costing, achieved by omparing the port's options at the close of the ear to those at the year's opening. It is shown that he financial accounting seriously underestimates he costs of operating a dredger and should not be sed. Also that the operation is capital intensive. If he NIVAG maintenance costs are reduced to the ort authority level, the capital distribution to the IVAG total is 65%. Research should therefore be irected towards the minimization of capital in-olvement rather than overtime limitation or fuel conomy. To increase output two basic choices re available: (a) purchase and employ larger or ore craft; (b) work existing craft more intensive-and/or reduce down time. (Auen-Wisconsin)
/76-01602

CHEDULING MAJOR CAPITAL EXPENDI-URES TO MINIMIZE COSTS,
lazen and Sawyer, New York.
/. B. Sinnott.
ournal American Water Works Association, Vol 7, No 5, p 271-174, 1975. 1 fig, 3 tab.

escriptors: *Water works, *Investment, *Annual osts, Interest rates, Construction costs, Financ-ig.

he effect on annual costs of scheduling water orks improvements is discussed. The practice of aking investment decisions based only on scalating construction costs fails to recognize the hanges in the value of the dollar. One method of ollar evaluation is to use the difference between he rates of change of construction costs and those r the cost of living, herein designated as 'relative scalation' of construction costs. Another factor n scheduling capital improvements is interest ates. Long-term downward trends and shortterm ariations offer excellent opportunities to chedule capital improvements to reduce overall osts. Among the examples cited are that a ecrease in interest rates of 0.25%/year will offset he effect of a 3%/year relative escalation of con-truction costs, and a decrease in interest rates of .42%/year will offset the effect of 5.0%/year rela-ve escalation in construction costs. Also varia-les in investment decisions are the effects of epreciation on capital improvements, broader nancing options with time, and avoidance of ad-itional operating costs by delayed construction. /ith interest rates at or near the top, forecasting eneral long-term trends would seem to be less sky than during a period of average rates. (Auen-/isconsin)
/76-01604

/ATER RATE REFORMULATION,
/ilmington Water Dept., Del. Water Commission.
. J. Maitland.
ournal American Water Works Association, Vol 7, No 5, p 262-263, 1975. 3 tab.

escriptors: *Public utilities, *Water rates, Pricing, *Equitable apportionment, *Delaware, /ater utilization, Cities, Suburban areas, Industri-l water.
dentifiers: Wilmington(Del).

he Wilmington, Delaware, water department esigned a new water rate structure to equalize ater costs between the city and suburban users, nd between small-volume users and large-volume ustomers. Alternative costs and price sets were eveloped based on management priorities, en-ineering, and economics. The typical city and ounty fixed and variable costs were built into ach cost set. Additional variable costs were built to the cost sets to reflect different management ecisions, such as city overhead, additional anagement staff, pension accruals, and a 3-6% eturn on investment. Engineering considerations ere used to distribute the fixed costs to arrive at base, fixed charge per customer based on the capacity factors of the variously sized meters. The new rate structure, which went into effect July 1, 1970, has been adequate to meet the costs of the water system through 1975. The side-effects generated by this rate revision were that some customers reduced their meter size, water consumption has dropped, new rate structure emphasizes accurate metering, which in turn necessitated acceleration of a meter-replacement program; meter readings are done oftener to divide the bill into smaller segments; and the 12-year interval in rate revisions resulted in a sizeable rate increase, causing customer dissatisfaction. (Auen-Wisconsin)
W76-01605

MUNICIPAL IMPOSTS AND LEVIES FOR ONTARIO WATER UTILITIES,
Beaufort Engineering and Development Ltd., Burlington (Ontario).
H. E. Sears.
Journal of American Water Works Association, Vol 67, No 5, p 258-261, 1975. 2 fig, 4 tab.

Descriptors: *Public utilities, *Water users, *Distribution systems, *Assessments, Local governments, *Canada, Pipelines, Installation costs.
Identifiers: *Ontario, Water installation charges.

The charges and assessments imposed by various Ontario municipalities on subdivision or industrial developments for installation of water service systems are detailed. In most new subdivisions the developer pays for a system that does not exceed 8 inches. About half of utilities pay for oversized mains--in excess of 6 inches. Most of the rest pay varying amounts according to a formula, which is different for virtually every municipality. In apartment developments, assessments vary from nothing to several hundred dollars per unit. It is difficult to establish what fraction of the levy is turned over to the water utility. In industrial developments the total cost of servicing is usually charged. However, there are relatively few service districts that make additional frontage charges for oversized mains. Although the Local Improvement Act offers the municipality the responsibility for providing fire protection, very few municipalities take this into account in their subdivision agreements. (Auen-Wisconsin)
W76-01606

DEMAND-RATE ECONOMICS,
Black and Veatch, Kansas City, Mo.
H. J. Lobb.
Journal American Water Works Association, Vol 67, No 5, p 247-250, 1975.

Descriptors: *Water rates, *Water demands, *Equity.
Identifiers: *Demand rates.

A substantial part of the annual costs of a water utility are related to providing and maintaining adequate system capacity to meet the maximum demands imposed upon the system, thus costs associated with meeting maximum demands should be properly recognized in the design of water rates. A demand rate for water service is a two-part rate in which customer charges are based upon both quantity of water used and the maximum rate of use and is more equitable than block-type rates. For example, any time the system's maximum demands are two or more times the average demand 50% or more of the system capital costs are allocable to demand capacity required. Studies of 11 water utilities indicated that extra capacity costs ranged from 30% to 46% of the total annual costs, or an average of 38%. Smaller users, as a group, characteristically have a maximum-to-average demand ratio that may require four additional units of extra capacity for every unit of water sold. Conversely, large users, as a group, have a ratio of maximum-to-average demand with extra capacity requirements of only one additional unit. Reduction or curtailment in maximum demands through appropriate charges can reduce the need for additional capital expenditures. (Auen-Wisconsin)
W76-01607

FORMULATION OF WATER RATES FOR BALTIMORE COUNTY, MD.,
Baltimore County Dept. of Public Works, Towson, Md.
W. J. Herberich.
Journal American Water Works Association, Vol 67, No 5, p 244-246, 1975. 5 tab, 1 ref.

Descriptors: *Water rates. *Formulation, *Public utilities, Water distribution(Applied), Water districts, *Maryland.
Identifiers: *Baltimore(Md).

The City of Baltimore operates all the water facilities in Baltimore County and faced a deficit of about $700,000 in fiscal 1973 unless the water rates for the county were revised. A water rate structure based on 'cash needs' through fiscal 1977 was formulated to meet the required revenue of $10.4 million. The minimum charge, based upon the ratio of capacity of a given meter size to the capacity of a 5/8-in. meter was not increased. The rating system for domestic usage was expanded from 5000 to 100,000 cu ft/quarter, thus combining the first two divisions of the sliding scale into one step. The intermediate step for usage between 100,000 and 1 million cu ft/quarter and the wholesale step for usage greater than 1 million cu ft/quarter were maintained. A service charge of $1.50/quarter for 5/8-in. meter and a commodity charge of $2.30/1000 cu ft of consumption in the domestic step were assigned which resulted in an annual charge at about $36 for an average domestic county customer. County constructed water facilities are not financed through the water rate structure but are financed by two annual charges and two one-time charges. (Auen-Wisconsin)
W76-01608

ECONOMIC IMPACT OF RECENT ENVIRONMENTAL LEGISLATION,
Water and Wastewater Equipment Manufacturers Association, Chicago, Ill.
R. Aldrich.
Industrial Water Engineering, p 12, 14, 16, 17, July/August 1973. 1 tab.

Descriptors: *Legislation, *Economic impact, *Pollution abatement, Industries, Recycling, Costs, Benefits, Financing.

The cost to industry necessary to bring pollution abatement facilities to meet existing or proposed environmental standards, in addition to capital cost should include operating and maintenance cost of these facilities; cost savings in possible recovery of waste material or energy; increased costs of raw materials and services due to pollution control by suppliers; size and age distribution of facilities; price elasticity or inelasticity inherent within any industrial classification; competitive factors--both at home and abroad; dependence on municipal waste treatment facilities by certain industry types and locations; and ability of industry to increase debt and how this relates to the individual corporation's potential growth. Although long-term pollution control costs will eventually be internalized, for the next five to ten years the impact of these additional costs must be alleviated. The primary need is to provide the lowest cost capital dollars with repayment scheduled over the longest period of time, thus reducing cash flow impact. This is best accomplished using 100% financing through tax-exempt pollution control industrial revenue bonds. Coupled with rapid depreciation of the pollution control facilities and the Investment Tax Credit amounts allowable, this financing technique can account for up to 30% in savings on the cost of the total investment. (Auen-Wisconsin)
W76-01610

TRUE COST OF CONVENTIONAL WATER,
Parsons, Brinckerhoff, Quade and Douglas, Inc., Denver, Colo.
F. W. Montanari, and D. E. Mattern.
Journal American Water Works Association, Vol 67, No 5, p 251-254, 1975. 6 fig, 1 tab, 4 ref.

Descriptors: *Water works, *Water costs, *Water sources, Water rates, Distribution.

The total costs and production costs of both private and municipal water utilities surveyed, grouped by population, are summarized. Utilities supplied primarily from ground water showed a higher unit cost for low production rates (up to 10,000 mil gal/yr) but a higher surface-water unit cost at incrased production rates. The 115 utilities reported serving about 67 million people. Of these, 109 serving about 45.3 million people reported about 8.4 million connections, and 92 serving about 33.1 million people reported a total of about 6.3 million residential connections and nearly 768,000 nonresidential connections. The aggregate production of the 115 utilities was almost 4.1 trillion gal/year. The average per capita production was about 186 gpd. The aberage total cost per person per year was about $18.50, or about 5 cents/person/day. Data by population groups broken down by source--ground, surface, and combinations--are shown. As the population range of the groups increases there are expected economies of scale. The effect of raising water rates in 68 cities was that 56 showed no effect on usage, one showed a decrease with a 50% rate incrase, three cities reported some decrease and eight reported a temporary or a slight effect. (Auen-Wisconsin)
W76-01611

TRENDS IN WATER RATES,
Black and Veatch, Kansas City, Mo.
C. W. Keller.
Journal American Water Works Association, Vol 67, No 5, p 255-257, 1975. 2 ref.

Descriptors: *Water rates, *Return(Monetary), Water works, Utilities.

The inflationary trend increases the propo rtion of revenues that must be devoted to operation and maintenance and the required investment per customer. Several methods of recovering water service costs are discussed. A recent trend has been to lessen the proportion of the cost to be refunded in local main installations and to shorten the allowed period of development. Many water systems make no refunds or require all main extensions to be installed by developers. Another trend has been to charge new customers a fee for 'back-up facilities.' The amount may range up to several thousand dollars per residential customer. If utility growth occurs because of added retail connections to a wholesale customer, one method is to charge a higher rate for use over a stated base amount. Current thinking in designing rate structures is presented in the AWWA Water Rates manual. That method usually results in usage of the meter block rate for the majority of customer classes and provides for unit charges that decrease as greater consumption levels are reached. Water price increases are only a slight deterrent to its use, as there is no elasticity in water demand, and would probable have little lasting effect on design of a major improvement. (Auen-Wisconsin)
W76-01612

HENRY GEORGE, PROPERTY RIGHTS AND ENVIRONMENTAL QUALITY: CLASSICAL ANSWERS TO 'NEW' PROBLEMS,
Clemson Univ., S.C.
For primary bibliographic entry see Field 5G.
W76-01614

THE ECONOMICS OF THE WEST COAST OIL SPILL CLEAN-UP INDUSTRY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5G.
W76-01624

A LOW COST WASTE TREATMENT METHOD FOR THE DISPOSAL OF DISTILLERY WASTE (SPENT WASH),
Walchand Coll. of Engineering, Sangli (India).
For primary bibliographic entry see Field 5D.
W76-01626

CLEAN WATER WILL COST $159 BILLION.
For primary bibliographic entry see Field 5G.
W76-01784

EPA COMPLETES NEW PLANT AND SEWER INDEX DATA SERIES.
For primary bibliographic entry see Field 5G.
W76-01785

GOVERNMENT DOLLARS TO FUEL 18% GROWTH IN 1976 SEWERAGE MARKET.
For primary bibliographic entry see Field 5G.
W76-01794

ECONOMICS OF WATER SUPPLY PLANNING AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W76-01802

PLANNING WATER RESSOURCES DEVELOPMENT.
Economic Commission for Asia and the Far East (UN), New York.
For primary bibliographic entry see Field 6B.
W76-01818

MEASUREMENT STANDARDS FOR PROJECT EVALUATION--PRICES AND INTEREST BY THE ECAFE SECRETARIAT.
For primary bibliographic entry see Field 6B.
W76-01819

PROJECT COSTS.
For primary bibliographic entry see Field 6B.
W76-01820

IRRIGATION DEVELOPMENT COSTS AT THE FARM LEVEL.
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6B.
W76-01821

FINANCIAL ANALYSIS.
For primary bibliographic entry see Field 6B.
W76-01824

UP-DIP VERSUS DOWN-DIP MINING, AN EVALUATION,
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5G.
W76-01868

6D. Water Demand

DEMAND-RATE ECONOMICS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 6C.
W76-01607

FORECASTING URBAN WATER USE: COMMERCIAL ESTABLISHMENTS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, R. C. Sutherland, and J. R. Kim.
Journal American Water Works Association, Vol 67, No 5, 239-244, 1975. 4 tab, 7 ref.

Descriptors: *Water demand, *Water utilization, *Forecasting, Equations, Future planning(Projected).
Identifiers: *Shopping centers, Commercial water usage.

With more than 55% of the total U.S. employment in the service sector and the moratorium placed on new sewer-line hookups in many areas, water-use relationships for commercial establishments will be able to anticipate water demand. Relationships for estimating average daily water use are provided for department stores and mall shops located in shopping centers from data compiled in one shopping center in Greendale, Wisconsin, one in Baltimore, Maryland and two in suburban Washington, DC. Water-use relationships and the estimates of floor space for each 4-digit SIC (Standard Industrial Classification) category were used to estimate the potential water demand. Most water use in commercial establishments is currently for domestic-type purposes but planners of water-demand forecasting models should consider water demand for nondomestic purposes. The gross store area was used to drive water-use relationships because that variable is easier to determine than the number of employees per shift. The linear model containing both slope and intercept coefficients provided better estimates than the linear model that does not include the intercept coefficient. The layout and design characteristics, transportation balance, and labor productivity would probably be the most important system variables in commercial water-demand forecasting. (Auen-Wisconsin).
W76-01609

POSSIBLE IMPACTS OF OIL SHALE DEVELOPMENT ON LAND RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5C.
W76-01691

SALT RIVER PROJECT ANNUAL REPORT, 1974.
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 6B.
W76-01704

ARIZONA ENERGY INVENTORY: A REPORT ON THE STATE'S ENERGY POSITION AND OUTLOOK TO 1985,
Arizona Univ., Tucson. Div of Economic and Business Research.
For primary bibliographic entry see Field 6B.
W76-01709

ENERGY DEVELOPMENT IN THE ROCKY MOUNTAIN REGION: GOALS AND CONCERNS.
Federation of Rocky Mountain States, Inc Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-01710

THE ROCKY MOUNTAIN REGION: A UNITY OF INTERESTS.
Federation of Rocky Mountain States, Inc. Denver, Colo.
For primary bibliographic entry see Field 6B.
W76-01712

ATIONSHIP OF DISCHARGE REDUC-
NS TO AVAILABLE TROUT HABITAT FOR
OMMENDING SUITABLE STREAM-
WS,
ming Univ., Laramie. Water Resources
arch Inst.
primary bibliographic entry see Field 4A.
-01809

ER USE, SEMINAR DAMASCUS.
l and Agriculture Organization of the United
ons, Rome (Italy). Land and Water Develop-
Div.
primary bibliographic entry see Field 3F.
-01878

ROLE OF EFFECTIVE IRRIGATION
ER MANAGEMENT AT THE FARMER'S
D,
l and Agriculture Organization of the United
ons, Rome (Italy).
primary bibliographic entry see Field 3F.
-01879

ER USE IN IRRIGATION PROJECTS IN
SYRIAN ARAB REPUBLIC,
national Commission on Irrigation and
nage, New Delhi (India); and Syrian National
mittee.
primary bibliographic entry see Field 3F.
-01880

ERMINATION OF WATER REQUIRE-
TS IN IRRIGATION PROJECTS,
ed Nations Development Program. Rome
).
primary bibliographic entry see Field 3F.
-01881

HNICAL ASPECTS OF WATER CON-
ANCE AND DISTRIBUTION SYSTEMS,
cultural Univ., Wageningen, (Netherlands).
primary bibliographic entry see Field 3F.
-01886

Water Law and Institutions

OMPARISON OF DECISION MAKING AND
INISTRATIVE ORGANIZATION FOR MU-
PAL WATER SUPPLIES IN MEDIUM-
D AND SMALL ILLINOIS MUNICIPALI-
;
is Univ. at Urban-Champaign. Dept. of
cultural Economics.
Van Es, H. Orr, and J. Quigley.
lable from the National Technical Informa-
Service, Springfield, Va 22161 as PB247-107,
in paper copy, $2.25 in microfiche. Illinois
ersity, Water Resources Center, Research
rt No 106, October 1975, 107 p, 40 tab, 11 ref,
end. OWRT A-075-Ill. 14-31-0001-5013(1).

riptors: *Illinois, *Decision making, *Water
y, *Municipal water, *Cities,
inistration, *Organizations, Urbanization,
r management(Applied), Planning, Local
rnments.
ifiers: Public decision making, Local
ing, Urban water management.

study was designed to provide information on
decision making and organizational charac-
ics of municipality owned water systems in
and medium-sized Illinois municipalities,
o relate these characteristics to municipal as
as other water system characteristics. Data on
unicipal water systems of 228 Illinois incor-
ed municipalities were gathered through mail
elephone surveys, as well as from secondary
es. The municipalities were chosen as part of
ercent sample, stratified by size, of all incor-
porated municipalities in Illinois with populations between 1,000 and 50,000. In addition to selected descriptive information on the water systems, the data are reported under water system decision making; planning and financial management; and technical management. Attempts to determine the relationships between the dependent variables and municipal and water system characteristics indicated a general weakness or absence of such relationships. While the quality of the data cannot be ruled out with certainty as the reason for the absence of the relationships, it is suggested that the relative lack of active interest on the part of municipalities in their water systems may account for the findings. The historical absence of the necessity to actively manage the water system other than in a routine fashion may have left these water systems quite unprepared to meet future sudden challenges.
W76-01503

GENERALIZED CRITERIA FOR VERIFICATION OF WATER DEVELOPED THROUGH WEATHER MODIFICATION,
Bittinger M. W. and Associates, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W76-01519

WHAT'S NEW IN WATER TREATMENT.
For primary bibliographic entry see Field 5F.
W76-01561

MANAGING THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-01597

CONVENTIONAL WISDOM PLUS A NEW PHILOSOPHY--CORPS OF ENGINEERS WATER RESOURCE PLANNING,
J. L. Cannon.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-006-452, $4.00 in paper copy, $2.25 in microfiche. Army War College, Carlisle Barracks, Pa., December 2, 1974. 25 p, 1 fig, 18 ref.

Descriptors: *Water resources development, *Planning, *Water management(Applied), *Legislation, *Federal government, *Water policy, *Non-structural alternatives, Federal government, Water resources, Planning act, Land use, Land management, U.S. Water Resources Council.
Identifiers: Urban studies programs.

With data obtained from U.S. statutes, congressional documents and publications of federal agencies, this report examines the Corps authority and responsibility in national resource planning which includes developing studies of major river basins, flood plains, waste water management, structural design, and coordinating and assessing federal policies and programs. National economic development and environmental quality objectives are used by the Corps to develop consistent programs and plans. COE's largest planning effort, the urban studies program, integrates water resources management with locally determined regional goals by developing alternative plans which include a capital improvements element, management (non-structural) program and revision program which provides flexibility and responsiveness to possible changes in needs. Today's COE's activities involve all aspects of planning for water and related land resources development to further environmental quality, economic development, and other national policy guidelines while cooperating with local, state and regional governments. Planning capabilities of COE represent a significant national asset for water resources development, land use planning and environmental quality enhancement. (Salzman-North Carolina)
W76-01598

FLOOD MANAGEMENT DECISIONMAKING IN THE CONNECTICUT RIVER BASIN: ANALYSIS OF THE EXISTING LEGAL, FINANCIAL AND INSTITUTIONAL FRAMEWORK FOR FLOOD PLAIN MANAGEMENT,
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 6F.
W76-01599

ECONOMIC IMPACT OF RECENT ENVIRONMENTAL LEGISLATION,
Water and Wastewater Equipment Manufacturers Association, Chicago, Ill.
For primary bibliographic entry see Field 6C.
W76-01610

FUTURE WATER POLICIES,
Soil Conservation Service, Washington, D.C. River Basins.
E. C. Buie.
Journal of Soil and Conservation, p 211-213, September-October 1973.

Descriptors: *Water policy, *National Water Commission, Water resources development, Federal government, Local governments, Cost allocation, Channel improvement, Irrigation, Agriculture, Financing, Flood control, Flood plains, Erosion control, Sedimentation, Recreation, Wildlife, Reservoirs.

Some comments on the 1973 National Water Commission's report discuss its conclusions regarding the role of the federal government in water resources development particularly the recommendation and its impact that the state and local agencies assume full responsibility for flood control, irrigation, drainage, water supply, and navigation, and that identifiable beneficiaries bear the full costs of all developments for flood control and irrigation; it would also impose charges on users of inland waterways. Recommendations are made that evaluation reflect costs estimates of damages caused by increased downstream flood and sedimentation, lowering groundwater levels, fish and wildlife habitat losses, and esthetic values in channelization projects. The Commission recommends that federally funded water resource development projects resulting in increased food and fiber production be fully repaid. Eighteen recommendations for changes are offered in flood control efforts. The report discusses the various federal programs and state responsibilities in recreation reservoirs and fish and wildlife aspects. It suggests user fees for recreation and does not recommend full federal funding for the recreational aspects of these developments. Major adjustments in the engineering responsibilities of the Soil Conservation Service, Army Corps of Engineers and the Bureau of Reclamation are suggested. There appears to be some dichotomy in recommendations for rural water development. (Auen-Wisconsin)
W76-01617

THE CONCEPT OF WATER RESOURCES DEVELOPMENT,
Central Water and Power Commission, New Delhi (India).
For primary bibliographic entry see Field 6B.
W76-01618

INSTITUTIONAL BEHAVIOR CONCERNING RIVER BASIN MANAGEMENT LEGISLATION,
Doane Coll. Crete, Nebr.
E. J. McPartland.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-247 326, $5.50 in paper copy, $2.25 in microfiche. Comple-

tion Report, 1975. 115 p, 23 tab, 32 ref. OWRT C-5071 (No 4202) (1).

Descriptors: Natural Resources, *Decision making, Administration, *Legislation, Planning, *Watershed management, *River basin development, *Nebraska, *Institutions, Political aspects, Water policy, Attitudes, Legal aspects, Water law.
Identifiers: *District reorganization, District boundaries, Policy formulation, Legislative behavior, Administrative behavior, Lobbying, Interest groups, Constituency influence.

This research was a case study and analysis of the most salient influences in the enactment of Natural Resources District legislation in the state of Nebraska. Research methods included extensive analysis of documents, open-ended interviews, and quantitative analysis of roll-call voting. The research results showed that reorganization legislation was the culmination of a six year controversy between a relatively small well-informed group of people with a great interest in soil and water conservation. The controversy was aired before an apathetic public and a Legislature that was not particularly familiar with the issue. The research further indicated that the level of public understanding was low, that there was considerable lobbying activity by various interests, that a few key individuals both in and out of the Legislature had a great impact on the controversy, that lobbying in some districts had an impact on the voting of legislators, that rural legislators were divided on the issue while urban legislators generally supported reorganization, and that some of the customs and practices of the Nebraska Legislature enhanced passage of the reorganization legislation.
W76-01682

SUMMARY OF 1975 ROCKY MOUNTAIN LAND USE AND NATURAL RESOURCE BILLS.
Federation of Rocky Mountain States, Inc., Denver, Colo.
October, 1975. 53 p, 1 tab.

Descriptors: *Rocky Mountain Region, *Land management, *Water management(Applied), *Natural resources, *Legislation, Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming, Water conservation, Water resources, *Land use, Land resources, Administration, Planning, Water law, Legal aspects.
Identifiers: Natural resources development, Natural resource bills.

A summary is provided of state legislative activity affecting land use and development of the natural resources of the Rocky Mountain states: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming. The bills summarized include water legislation, mineral taxes, impact areas' taxes, plant siting laws, conservation, environmental protection, reclamation, land use, manpower training, research units and interim committees, and other natural resource issues. Water legislation is divided into allocation, minimal requirements, agricultural properties, quality, and state's rights. Each bill is listed, briefly summarized, and its failure or passage is indicated. (Robinett-Arizona)
W76-01711

R AND D PRIORITIES ON THE NATIONAL AGENDA FOR WATER POLLUTION CONTROL,
Water Pollution Control Federation, Washington, D.C. Research Committee.
For primary bibliographic entry see Field 5G.
W76-01733

ENVIRONMENTAL CHEMISTRY IN THE NETHERLANDS,
Waterloo Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-01734

FACILITIES PLANS: CLEARING UP THE CONFUSION,
For primary bibliographic entry see Field 5G.
W76-01782

SAFE DRINKING WATER ACT, ACT I SCENE I OF HERE WE GO AGAIN,
For primary bibliographic entry see Field 5G.
W76-01788

LOCAL LAND USE CONTROL OVER CRITICAL AREAS,
American Society of Planning Officials, Chicago, Ill.
C. Thurow.
Civil Engineering-ASCE, Vol 45, No 9, p 73-76, September, 1975. 4 fig.

Descriptors: *Land use, *Local governments, Environmental control, State governments, Legislation, Permit, Developed waters, Standards, Groundwater, Sand aquifers, Wetlands, Streams.
Identifiers: Land development, Special interest groups.

States can no longer handle all of the environmental problems and decisions that may develop. Along the southeastern coast of Texas recently, the sand aquifier has been heavily pumped, causing groundwater to be extracted faster than it could be replaced. Expensive problems have developed. The willingness of local communities to become involved in regulating local environmental problems is discussed. The planner in a community is the best qualified on a local level to judge what degree and type of development a particular area will tolerate. The other approach is by making local ordinances prohibiting certain types of development or limiting use of such areas as wetlands or streams. Most ordinances remain simple, allowing light use or use with a special permit, but some have moved beyond that stage. Very few have been challenged in court, the most important reason being that they are more flexible than they appear. Their main purpose is to insure the involvement of local government in the development process. They force a case by case administrative process, requiring more time and more expertise on the local level. Disadvantages that may arise are the probabilities of human error in difficult decisions and pressure from special interest groups. Environmental performance standards can overcome some of the difficulty, by promoting compatible development. (Pinto-FIRL)
W76-01790

REGIONAL INSTREAM FLOW NEEDS IN THE PACIFIC NORTHWEST: AN ANALYSIS OF INSTITUTIONAL, LEGAL, AND TECHNOLOGICAL ASPECTS OF ALLOCATION PROCESSES FOR LIMITED STREAMFLOW,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 6B.
W76-01797

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART I, EFFECT OF THE 'REVIEW AND COMMENT PROCESS' ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01800

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01801

AN INNOVATIVE ORGANIZATIONAL A RANGEMENT FOR COMPREHENSIVE WAT SERVICES: THE THAMES WATER AUTHO TY AS A MODEL FOR COMPLEX AREAS THE GREAT LAKES,
Michigan Univ., Ann Arbor. Dept. of Civil gineering.
J. W. Bulkley, and T. A. Gross.
Available from the National Technical Infor tion, Springfield, Va 22161 as PB-247 462, $4.0 paper copy, $2.25 in microfiche. Completion port Institute of Water Research, Michigan S University, East Lansing September 1976. p, 3 1 tab, 29 ref, 3 append. OWRT A-083-MICH 14-31-0001-5022

Descriptors: *Water resources manageme *Urban areas, *Institutions, *Foreign resear Cities, Public utilities, Water policy, Public ut districts, Municipalities, Planning, Organiz *Organizations, *Great Lakes.
Identifiers: *Thames Water Author *Comprehensive water services, Chicago, Detr Cleveland, England, Wales.

A need exists for regional consideration evaluation of comprehensive water services complex urban areas. The Thames Water Auth ty (TWA) in England provides such comprehensive water services to the entire Thames R Basin including metropolitan London; an are 5000 square miles with a population of 12 mill In recognition of the possible application of su concept to complex urban areas of the G Lakes, the principal investigator spent six mo as a participant-observer with the Authority provides a detailed description of its organiza and operation. In addition, criteria are establis by which water services in complex urban a may be evaluated and the TWA is so evalua Preliminary evaluations are also provided Chicago, Detroit and Cleveland.
W76-01815

PLANNING WATER RESSOURCES DEVELOPMENT.
Economic Commission for Asia and the Far (UN), New York.
For primary bibliographic entry see Field 6B.
W76-01818

SOCIAL AND NON-ECONOMIC CONSIDERATIONS IN WATER RESOURCES PLANN AND DEVELOPMENT.
For primary bibliographic entry see Field 6B.
W76-01825

CO-ORDINATING THE ACTIVITIES OF AGENCIES GOVERNING WATER RESOUR DEVELOPMENT AND RELATED FIELDS.
For primary bibliographic entry see Field 6B.
W76-01826

WATER USE, SEMINAR DAMASCUS.
Food and Agriculture Organization of the U Nations, Rome (Italy). Land and Water Deve ment Div.
For primary bibliographic entry see Field 3F.
W76-01878

IRRIGATION ORGANIZATIONS,
Food and Agriculture Organization of the U Nations, Rome (Italy).
For primary bibliographic entry see Field 3F.
W76-01889

THE COMMON HERTIAGE OF MANKIND A LEGAL CONCEPT,
Connecticut Univ., Storrs. School of Law.
R. P. Arnold.
The International Lawyer, Vol 9, No 1, p 153-8 1975. 6 p, 16 ref.

criptors: *Subsoil, *Ownership of beds, isdiction, *International law, *Mining, Trea- Natural resources, Legal aspects, Submerged s, United Nations, Foreign countries, Boun- es(Properly), International waters, Beds, ources development, Resources, Oceans, eral industry.

United Nations General Assembly Resolution , 'Declaration of Principles Governing the ed and the Subsoil Thereof, Beyond the its of National Jurisdiction', states that the eds resources are the 'common heritage of kind'. Many jurists have complained that this common heritage of mankind' expresses no concept. The author, however, believes the se carries a clear judicial connotation: world- common ownership of the seabed and its urces beyond the limits of national jurisdic- Viewed from this perspective, the phrase can id to create a legal rule of joint property in the ed and its resources, thus preventing an in- ual state from exercising its individual right to erty held jointly with the other states of the d. Under this rule, individual state would be to mine the seabed, but subject either to terms onsent as expressed in some international y or to some form of benefit sharing. Such a is a necessary acknowledgement that environ- al protection and sharing of world resources the best interest of all nations. (Hoffman- da)
-01952

MEMORIAM: RAINBOW BRIDGE NA- NAL MONUMENT,
primary bibliographic entry see Field 6G.
-01953

FISHERIES JURISDICTION CASES: THE TRIBUTION OF THE INTERNATIONAL RT OF JUSTICE TO THE DEBATE ON STAL STATES' FISHERIES RIGHTS,
sh Inst. of International and Comparative , London (England).
Churchill.
national and Comparative Law Quarterly, 4, Part 1, p 82-105, 1975. 24 p, 53 ref.

riptors: *International Law, *Commercial ng, *United Nationa, *Boundary disputes, itorial waters, Conferences, Fisheries, Trea- Preferences(Water rights), Jurisdiction, Inter- nal waters, Atlantic Ocean, Europe, Judicial ions, Law of the Sea, International Commis- , Coasts.
ifiers: *U.N. Conference on the Law of the Iceland, International Court of Justice, Great in, West Germany, Coastal states.

of the central issues before the Third U.N. erence on the Law of the Sea is the extent of al States' rights over living resources. Mid- hrough this meeting, the International Court stice decided two important fisheries jurisdic- cases dealing with this problem. Iceland and Britian and Iceland and West Germany were tigants. Following a failure of the interna- conference to agree on the breadth of the orial sea, Iceland extended its exclusive fish- one to fifty miles. The two applicant states t a determination of whether Iceland's claim ontary to international law, and whether con- tion of fish stocks was subject to interna- regulation. A majority of the Court held that d had preferential rights in waters beyond velve mile limit, but refused to say that such have a basis in international law. rential rights exist when a coastal State is al dependent on coastal fisheries. This theory debatable validity since it stems from custo- rather than legal precedent. (Jenkins-Florida) 01954

COMPREHENSIVE WETLANDS PROTECTION: ONE STEP CLOSER TO FULL IMPLEMENTATION OF SECTION 404 OF THE FWPCA.
Environmental Law Reporter, Vol 5, No 7, p 10099-10104, July, 1975. 6 p, 28 ref.

Descriptors: *Navigable waters, *Wetlands, *Federal Water Pollution Control Act, *Federal jurisdiction, *Administrative agencies, Judicial dicisions, Fish reproduction, Wildlife habitats, Environment, Flood control, Ecology, Ecosystems, Environmental effects, Marshes, Tidal marshes, Regulation, Permits, Water conservation, Preservation.
Identifiers: *Ecological functions, *FWPCA Amendments of 1972.

There has been considerable disagreement concerning the scope of federal regulatory jurisdiction over dredge and fill activities throughout the nation under Section 404 of the Federal Water Pollution Control Act Amendments of 1972. A recent court ruling has held that Section 404 expands the Army Corps of Engineers' jurisdiction over the depositing of dredged or fill material to 'waters of the United States', and not just to 'navigable waters'. The former term is much broader, encompassing non-tidal, inland wetlands which provide areas vital to fish propagation, natural flood control, and wildlife habitat. As a result of this decision, the Corps, which favored the more restrictive interpretation, published proposed revised regulations concerning its permit jurisdiction under Section 404. The Corps accompanied publications of the proposals with a press release aimed at stirring up public sentiment against the enlarged jurisdiction of Section 404. The facts and reasons behind the Corps negative reaction to a broad reading of Section 404 are explored in detail. (Hoffmand-Florida)
W76-01955

MARICULTURE: A NEW OCEAN USE,
Georgia Univ., Athens. Inst. of Government.
J. O. Smith, and D. L. Marshall.
Georgia Journal of International and Comparative Law, Vol 4, p 307-342, 1974. 36 p, 246 ref.

Descriptors: *Marine plants, *Aquatic plants, *Jurisdiction, *International law, International waters, Oceans, Marine biology, Water types, Law of the Sea, Estuaries, Foods, Food abundance, Productivity, Standing crops.
Identifiers: *Mariculture, *Coastal waters, Contiguous zone, Marine sanctuaries.

The authors suggest that future world food requirements may lead to use of territorial waters and high seas for purposes of mariculture--the artificial culture of marine organisms. A coastal nation's sovereignty diminishes seaward of the shoreline, and so possible international interference with American entrepreneurial efforts in this regard will increase proportionally to the distance of a given enterprise from American territory. Examples of maricultural endeavors include transplantation of clams and oysters to improved habitats and the maintenance of cultures of shellfish and free-swimming fish in enclosures suspended near the water surface. The authors conclude that the barriers to these enterprises represented by international law of the sea are not as great as might be expected, even in the realm of the high seas. Mariculture activities are legally distinguishable from extant ocean uses and should be treated differently from such practices as fishing, navigation, and mineral exploration and exploitation. The authors survey the state of relevant existing law as it affects maricultural purposes in each of five ocean areas: (1) territorial waters between the coastal baseline and a line three miles seaward; (2) the contiguous zone, between three and five miles from the baseline; (3) the high sea beyond twelve miles; (4) the submerged lands under the territorial sea; and (5) the continental shelf. (Gerlach-Florida)
W76-01956

INVENTORY AND QUANTIFICATION OF FEDERAL WATER RIGHTS: A COMMON DENOMINATOR OF PROPOSALS FOR CHANGE,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
W. Kiechel, Jr.
Conference 'Water Law Issues--'75', Section of Natural Resources Law, ABA, Denver, Colorado, February, 1975. 15 p.

Descriptors: *Reservation Doctrine, *Federal jurisdiction, *Federal-state water rights conflicts, *State jurisdiction, Water rights, Water law, Water, Water control, Legislation, Water utilization.
Identifiers: *Sovereign immunity, *Citizen suits, *Standing(Legal).

This speech analyzes a bill which would require the inventorying and quantification of federally reserved rights to bodies of water. The United States owns the right to use the waters upon, within, and adjacent to the public domain which have not previously been appropriated by others under authority of an act of Congress. When public lands are withdrawn or reserved for authorized purposes requiring the use of water, the United States also reserves the right to use a sufficient amount of the unappropriated waters pertaining thereto to accomplish such purposes. These 'reserved rights' have been the subject of criticism and controversy and have created a great deal of friction between state and federal agencies. To alleviate these problems, the proposed legislation would require, inter alia, the head of each federal agency within five years after enactment to prepare an inventory of all reserved, appropriative, and other water rights under the administrative juridsdiction of that agency within each state. The bill further authorizes the maintenance of suits against the United States for judicial review of the rights listed in the inventorial and of administrative determinations in their listing and quantifications. Such review can be accomplished without resort to general adjudication proceedings. The author contends that the process of inventory and quantification, with judicial review of the nature described, is preferable to general judicial proceedings in state courts for purposes of removing the 'mystery' which has cloaked the federal reserved rights doctrine in the past. (Gerlach-Florida)
W76-01957

ANTITRUST AND POLLUTION CONTROL: AN EPA PERSPECTIVE,
Environmental Protection Agency, Washington, D.C. Office of General Counsel.
For primary bibliographic entry see Field 5G.
W76-01958

WATER QUALITY STANDARDS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PRODUCTIVE BUT UNREALISTIC,
For primary bibliographic entry see Field 5G.
W76-01959

INTEGRATING GROUND AND SURFACE WATER USE IN AN APPROPRIATION STATE,
Davis, Graham and Stubbs, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-01960

THE FUTURE OF ENVIRONMENTAL DEFENSE,
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-01961

IMPROVEMENT OF THE QUALITY OF WATER SUPPLY SOURCES (POLICY STATE-

MENT OF AMERICAN WATER WORKS ASSOCIATION).
Journal of the American Water Works Association, Vol 67, No 8, p A19-A20, Aug. 1975, 2 p.

Descriptors: *Water resources development, *Water supply, *Water quality control, *State governments, *Planning, Water purification, Water quality standards, Costs, Industrial water, Beneficial use, Water allocation(Policy), Priorities, Research and Development, Administration, Federal government, Education, Recreation, Water utilization, Water demand.
Identifiers: State policy.

Protection and improvement of industrial and municipal water supplies is the goal of the American Water Works Association Journal. Enhancement of the economic value of water for industrial use, and safeguarding of the sanitary and aesthetic value of domestic water, cannot be achieved by effluent limitations alone. Careful planning is of paramount importance. Furthermore, state governments should have primary responsibility for water quality control, since nationwide discharge standards are unrealistic and uneconomical. However, continuing federal financial assistance will be necessary for some states. Other proposals include: (1) greater use of water quality improvement techniques such as low flow augmentation, watershed management, and control of saline water sources; (2) intensification of research and development efforts, especially in the area of physiological effects of contaminants; (3) strengthening of programs to train personnel for the water supply industry; and (4) education of the public in more efficient methods of water usage. (Jenkins-Florida)
W76-01962

THE SAFE DRINKING WATER ACT AND EPA'S ROLE IN TRAINING,
Environmental Protection Agency, Washington, D.C., Division of Water Supply.
For primary bibliographic entry see Field 5G.
W76-01963

CAN NEW YORK'S WETLANDS BE SAVED. A CONSTITUTIONAL AND COMMON LAW SOLUTION,
J. L. Stockholm.
Albany Law Review, Vol 39, No 3, p 451-493, 1975. 42 p, 299 ref, 1 append.

Descriptors: *Wetlands, *Constitutional law, *New York, *Land use, *Ownership of beds, Legislation, Water law, Conservation, Aquatic environment, Regulation, Land management, Land resources, Non-structural alternatives, Land classification, Marshes, Water injury, State governments, Federal government, Judicial decisions.
Identifiers: Fifth Amendment, Police power.

New York passed a Tidal Wetlands Act in 1973 placing a temporary moratorium on all development in the wetlands until land use regulations are issued. Because the fragile nature of the wetlands requires that strict use limitations be imposed to protect them, a fifth amendment 'taking' challenge will likely follow the issuance of the regulations. This comment attempts to anticipate that challenge and show how the Act and its regulations can be upheld. It first examines the extent of the state's interest in protecting the wetlands and the necessity of finding some valid method of conservation. Then the history of the fifth amendment taking clause is surveyed, as well as factors which will play a vital role in balancing whether the regulations are a valid exercise of the state's police power or whether they constitute a 'taking'. Finally, a review is made of the state's property interests in the wetlands and some proposals advanced concerning the courses of action available to the state. One additional factor the state must take into consideration is the 1975 Supreme Court decision in United States v Maine in which the federal government was declared to have paramount right and title to the seabeds beyond the three - mile limit. (Hoffman-Florida)
W76-01964

INTERNATIONAL STRAITS: THE RIGHT OF ACCESS,
Army Staff Judge Advocate's Office, Berlin (Germany).
R. P. Cundick.
Georgia Journal of Inter and Comp Law, Vol 5, No 1, p 107-140, 1975, 34 p, 102 ref.

Descriptors: *Access routes, *Navigation, *Straits, *International law, *Coasts, Channels, Inland waterways, Law of the sea, Military aspects, Navigable waters, Reasonable use, Foreign trade, International waters, Ships, Treaties, Conferences, Foreign countries.
Identifiers: International conferences, Territorial seas, Innocent passage, Free passage.

The expansion of claims to the territorial sea by coastal states has caused serious problems concerning the right of access to international straits. The proposals attempting to address these problems fall into two general categories: those advocating an innocent passage regime, and those advocating a free passage regime. Innocent passage, applicable within the territorial sea of a state, permits transit only by above water vessels which do not threaten the peace and security of the coastal state. Free passage permits navigation by all vessels and aircraft, without distinction. This article analyzes the varying effects these two approaches would have on various problems including: (1) sovereignty and access respecting the sea; (2) access to ports; and (3) access from high seas to high seas. Also presented are historical data on numerous international conferences, treaties, and special agreements which have dealt with the problem of free access. Most of these conferences and treaties have shown a trend toward greater freedom of access. (Hoffman-Florida)
W76-01965

DEEPSEA ADVENTURES: GROTIUS REVISITED (PRIVATE CORP. CLAIM TO DEEPSEA MINERAL RIGHTS),
Inter American Development Bank Washington, D.C. Legal Dept.
G. Biggs.
International Lawyer, Vol 9, No 2, p 271-281, 1975, 11 p, 22 ref.

Descriptors: *Law of the Sea, *Jurisdiction, *International law, *Exploitation, *Continental shelf, Natural resources, Mining, Leases, Exploration, Leases, Withdrawal, Mexico, Oceans, Water utilization, Consumptive use, Economics, Beds, Ownership of beds, Boundary disputes, Foreign countries, United States, Exploration, Manganese.
Identifiers: *Coastal states, *Mineral deposits.

Several important issues are raised by the claim of Deepsea Ventures, Inc. to exclusive mining rights on the eastern Pacific Ocean some 1,300 kilometers off the coast of Mexico. Deepsea has filed two documents with the Secretary of State of the United States; a Notice of Discovery and Claim of Exclusive Mining Rights, and a Request for Diplomatic Protection and Protection of Investments. In these documents Deepsea asserts exclusive rights to develop and mine the deposit and to take, use and sell all metals derived therefrom. One of the legal premises for Deepsea's claim is a positive rule of international law which permits the acquisition of exclusive rights to explore and exploit manganese nodules in the seabed beyond national jurisdiction. Diplomatic protection, however, is necessary for the preservation and exercise of such rights. Furthermore, Deepsea contends its claim is supported by the Convention on the High Seas which specified exploitation of resources on the abyssal ocean floor to be a freedom recognized by general principles of international law. The author disputes the validity of Deepsea's claim and presents evidence rebutting its argument. (Hoffman-Florida)
W76-01966

CRIMINAL PROSECUTION UNDER THE ALASKA ENVIRONMENTAL CONSERVATION ACT OF 1971: STOCK V STATE,
For primary bibliographic entry see Field 5G.
W76-01967

LOCAL REAPPORTIONMENT: THE EXEMPTION OF WATER MANAGEMENT DISTRICTS,
Virginia Polytechnic and State Univ., Blacksburg. Dept. of Political Science.
P. L. Martin.
Santa Clara Lawyer, Vol 14, No 1, p 31-45, 1974, 15 p, 97 ref.

Descriptors: *Constitutional law, *Water districts, *Public utility districts, *Government, *Population, Judicial decisions, Water law, Legislative review, Watershed management, Economics, Density, Drainage districts, Legal aspects, Institutional constraints, Political aspects, State government.
Identifiers: Reapportionment, Elections.

In Reynolds v Sims, the Supreme Court declared that in accord with the Constitution a state must make 'an honest and good faith effort to construct districts in both houses of its legislature, as nearly of equal population as is practicable.' Subsequent decisions, however, left room for equal apportionment exemptions. These decisions recognized that there might be some cases in which a State elects certain functionaries whose duties are so far removed from normal governmental activities and whose effects on different groups are so disproportionate that a popular election in compliance with Reynolds might not be required. Two recent Supreme Court decisions found such an exemption applicable. In one, a water management district was classified as a government of special powers because it did not perform normal governmental duties. The Court also found the financial burden of the district to be distributed in the same manner as the right to vote. In the other case, the Court upheld a statue allowing a watershed improvement district referendum permitting only landowners in the affected area to vote. The while the 'one person, one vote' philosophy pervades all levels of government, variations of local apportionment have been approved in the past and will continue to raise questions about representation in the future, especially in areas of ecological concern. (Hoffman-Florida)
W76-01968

WATER MANAGEMENT IN ONTARIO-AN ECONOMIC EVALUATION OF PUBLIC POLICY,
British Columbia Univ., Vancouver. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-01969

TOWARD AN INTERNATIONAL STANDARD OF ENVIRONMENT,
Georgetown Univ., Washington, D.C. School of Law.
G. P. Smith, II.
Pepperdine Law Rev, Vol 2, No 1, p 28-51, 1974, 23 p, 66 ref, 1 append.

Descriptors: *International waters, *International Commissions, *Environmental effects, *United Nations, Political aspects, Institutional constraints, Political constraints, Costs, Economic impact, Planning, Ecology, Welfare(Economics), Pollution, Standards, Regulation, Coordination.
Identifiers: *Earthwatch, Environment Program, U. N. Conference on the Environment, Eff

laration on the Human Environment, Third rld.

nomic development generally takes cedence over environmental protection in rd World Countries. This and other factors plicating achievement of international en- nmental standards were discussed in 1972 at a ference on environmental management held in ckholm, Sweden. Views of the conference are rporated in the Draft Declaration on the nan Environment. An Action Plan spells out e steps necessary to solve global environmen- problems. The first step is a monitoring and luation network called Earthwatch which in- les the creation of an international mechanism the exchange of information. Environmental agement of certain activities at an interna- al level is a second element while support ac- ies for the other two facets of Action Plan con- te the third. The Conference issued nine other posals relating to specific environmental is- . The U.N. General Assembly did not formally rove the Declaration, but did establish a ted Nations Environment Program centered in robi. The purpose of the Stockholm Con- nce was to focus world attention on environ- tal problems. Solutions to those problems uld follow. (Jenkins-Florida)
5-01970

T CASE ON OCEAN DUMPING: MUST LADELPHIA MOVE TOWARD ON-LAND POSAL OF SEWAGE SLUDGE.
primary bibliographic entry see Field 5G.
5-01971

I CONCLUDES WATER ACT ENFORCE- NT STUDY.
primary bibliographic entry see Field 5G.
5-01972

N V ANDREWS (ACTION FOR INJUNC- N AND DAMAGES AGAINST LOWER AD- NING LANDOWNERS FOR FLOODING).
So 2d, 424-425, (1st DCA FLA, 1975), 2 p.

criptors: *Florida, *Backwater, *Standing ers, *Drainage effects, *Adjacent landowners, ace run-off, Surface waters, Drainage ems, Surface drainage, Judicial decisions, alties(Legal), Rain water, Water levels, Flood- Drainage, Controlled drainage, Drainage er, Legal aspects, Water law, Water rights, rland flow.
tifiers: Injuctions, Upper adjoining lan- ner, Lower adjoining landowner, Intentional .

er adjoining landowners brought an action nst the lower adjoining landowners for manda- injunction and damages alleging that a dirt fill ed on defendants' land caused an increase in mount of standing water on plaintiffs' proper- he defendants created the dirt fill for the pur- of building a patio on a concrete slab. The cture impeded and obstructed the natural age of water from plaintiff's lot, and caused tanding water. The trial court ordered defen- 's to restore the natural drainage and awarded tiff damages. Defendants appealed urging since the land of both parties abut Black k, plaintiffs should provide drainage from land directly to the creek. The District Court cted this argument and in affirming liability, that an upper adjoining owner has a servitude he land of the lower adjoining landowner in ect to water naturally flowing onto the lower . However, the judgment awarding damages unused because the trial court awarded ages exceeding the pleadings. (Hoffman- da)
-01973

MORELAND V ACADIAN MOBILE HOMES PARK, INCORPORATED (INTERFERANCE WITH NATURAL DRAINAGE).
313 So, 2d 877-86 (La. App 1975), 10 p.

Descriptors: *Louisiana, *Judicial decisions, *Drainage systems, *Penalties(Legal), *Sewage effluents, Legal aspects, Water law, Drainage, Controlled drainage, Drainage engineering, Drainage water, Drainage effects, Water control, Water conveyance, Discharge(Water), Effluents, Sewage disposal, Conveyance structures, Competing uses.
Identifiers: Injunctive relief, Swales, Servitudes.

Plaintiff homeowners brought an action against defendant mobile home park for damages and to enjoin defendant from discharging effluents into a drainage swale running through plaintiffs' property. The effluents were discharged from a sewage disposal system installed in connection with the mobile home park. Defendant contended that no alteration was made in the natural drain running across its property, and that it was impossible for defendant to restrict its use of the natural drain so as to comply with plaintiffs' demands. The Second Circuit Court of Appeal of Louisiana held that, while under Louisiana law, a servitude is created when the estate situated below receives waters running naturally from the estate situated above, the installation of the sewage disposal plant on defendant's property constituted a substantial change in the nature of the servitude, rendering it more burdensome to plaintiffs. However, since the effluent had no odor and presented no health hazard, damages rather than injunctive relief was the appropriate remedy. (Nursey-Florida)
W76-01974

GENE B. GLICK COMPANY, INC. V MARION CONSTRUCTION CORP. (DISCHARGE OF WATER FROM UPPER WATERSHED).
331 N.E. 2d. p 26-39 (Indiana, Court of Appeals 1975), 14 p.

Descriptors: *Indiana, *Judicial decisions, *Drainage systems, *Drainage effects, *Penalties(Legal), Legal aspects, Water law, State governments, Controlled drainage, Drainage water, Ditches, Sewers, Water control, Water conveyance, Discharge(Water), Subsurface drainage, Drainage engineering.
Identifiers: Injunctions(Mandatory).

Plaintiff, owners of lower lands, brought an action seeking injunctive relief and damage for the discharge of water from an upper watershed area. Defendant subdivision developer had established, by a system of interconnected ditches and subterranean storm sewers, a drainage system which concentrated the discharge of drainage from the upper watershed area onto plaintiffs' land causing flooding in this lower land. The First District Court of Appeals of Indiana held that, although the owner of the upper watershed could properly collect normal quantities of water which fill on his land and direct them to channels on his property, he could not direct the concentrated waters to a point where no natural watercourse existed, or so increase flowage as to cause damage to lower property. The court held that the increased drainage flow caused permanent injury to plaintiffs' property and, therefore, monetary damages was the proper legal remedy. (Nursey-Florida)
W76-01975

SUN ENTERPRISES, LTD V TRAIN (DREDGING AND SEWAGE DISPOSAL IN WETLANDS).
394 F Supp. 211-25 (S.D. New York, 1975), 15 p.

Descriptors: *Sewage disposal, *Wetlands, *Permits, *Federal Water Pollution Control Act, *Administrative decisions, Environmental effects, Judicial decisions, Dredging, Regulation, Administrative agencies, Adjudication procedure, Water law, Navigable waters, Water pollution sources, Sewage effluents, Jurisdiction.
Identifiers: Development projects, Administrative authority.

A real estate developer was issued a permit by the Environmental Protection Agency authorizing the discharge of sewage treatment effluent into state waters. Subsequent to the issuance of the permit, plaintiff wetland owners brought this action against the developer and particular government officials seeking various forms of relief from the dredging and sewage disposal activities of the developer. The court dismissed all claims against the government officials, finding that they did not violate any of their duties in issuing the permit under the Federal Water Pollution Control Act (FWPCA). The court, however, allowed to stand a claim for relief against the developer for discharging dredged or fill materials into waters of the U.S. without a Corp of Engineers permit in violation of the FWPCA. The developer asked for a dismissal of the claim, contending that the permit was not required because the receiving body was not a 'navigable water' as required by the Act. The court held that the purposes of the FWPCA require 'navigable waters' to be broadly defined so as to include all water bodies for water quality purposes. Thus, the traditional narrow definition of 'navigable waters' was held not to be controlling when applied to the FWPCA. (Hoffman-Florida)
W76-01976

UNITED STATES V RESERVE MINING COMPANY (DISCHARGE OF TACONITE TAILINGS INTO LAKE SUPERIOR).
394 F Supp 233-45 (D. Minnesota, 1974), 13 p.

Descriptors: *Mine wastes, *Minnesota, *Navigation, *Judicial decisions, *Permits, Water pollution sources, Water pollution effects, Public health, Environmental effects, Legal aspects, Regulation, Navigable waters, Water quality control, Water quality standards, Law enforcement, Water policy, Mineral industry, State government, Federal government, United States.
Identifiers: Refuse Act, Estoppel.

The United States and various state plaintiffs brought this action charging defendant mining company with statutory violations of the Refuse Act arising out of defendant's discharge of taconite tailings into Lake Superior. Since defendant had a Refuse Act permit, the major issue was whether the terms of the permit sanctioned the specific conduct that was challanged by plaintiffs. The Refuse Act had been consistently construed to be applicable only to those discharges impeding navigation. Recently, however, courts have given the Act a broader construction and extended its coverage to discharges that are harmful without respect to their effect on navigability. Following this trend, the court found that defendant's discharges were not sanctioned by the Act. Nevertheless, defendant contended that the principles of estoppel should preclude plaintiffs' claim, since defendant's permit was reissued in 1960 when the prevailing view that the only proper consideration under the Refuse Act was the effect a particular discharge might have on navigability. The court held, however, that the government's claim was not estoppel because of the issuance of the permit. In so holding, the court took judicial notice of public health considerations and various other factors. (Hoffman-Florida)
W76-01977

P F Z PROPERTIES, INC V TRAIN (DREDGING AND DEVELOPMENT OF MANGROVE WETLANDS).
393 F Supp, 1370-1382 (D DC 1975), 13 p.

Descriptors: *Federal Water Pollution Control Act, *Navigable waters, *Dredging, *Mangrove swamps, *Permits, Legislation, Wetlands, Environmental effects, Legal aspects, Jurisdiction,

Water law, Water pollution sources, Balance of nature, Judicial decisions, Classification, Construction, Landfills.
Identifiers: Biological productivity, Injunctions.

Plaintiff developer was dredging and filling mangrove wetlands in order to construct an apartment complex when charged with violation of the Federal Water Pollution Control Act (FWPCA) for discharging dredged materials into waters of the U.S. without a permit from the Environmental Protection Agency (EPA). Plaintiff brought this action for declaratory and injunctive relief against the Administrator of the EPA, contending that the mangrove wetlands were not 'waters of the U.S.' within the meaning of the FWPCA, and thus not subject to the Act's permit requirements. Defendants relied on three grounds in asserting jurisdiction over the wetlands. First, they asserted that the wetlands were navigable waters of the U.S. by virtue of a canal extending through them which was used for commercial purposes in the past. Second, they asserted that the wetlands were 'waters of the U. S.' because of the biological productivity and importance of the area. Finally, the wetland waters are a potential source from which pollutants may flow into recogined navigable waters. The court, finding all three assertions to be supported by the evidence, held that plaintiff's development was subject to the permit requirements of the FWPCA and denied any relief. (Hoffman-Florida)
W76-01978

CHOCTAW NATION V CHEROKEE NATION (DISPUTE OVER TITLE TO BED OF ARKANAS RIVER).
393 F Supp, 224-246, (ED Okla 1975), 23 p.

Descriptors: *Oklahoma, *Treaties, *Ownership of beds, *Boundary disputes, *Indian reservations, Judicial decisions, Legal review, Beds under water, Legal aspects, Governmental interrelations, Adjacent land owners, Boundaries(Property), Water law, Water rights, Common law, Riparian lands, Non-navigable waters, Common law, Rivers, Beds.
Identifiers: *Arkansas River(Title to bed).

Suit was brought to quiet title to a designated stretch of the natural bed of the Arkansas river. Plaintiff Choctaw and Chickasaw Nations contended that they owned an undivided interest in the entire bed. Defendant Cherokee Nation, while conceding that plaintiffs owned the south half of the bed, contended that it owned the north half of the bed. At trial the case centered around the interpretation of numerous treaties between the United States and the Indian Nations. One of the major issues was whether the bed of the river was conveyed in grants which used the Arkansas river as a boundary. The court found that when the United States disposes of riparian lands, and no intent to restrict the conveyance to lands ending at the bank is shown, and lands are not within a state, then what the grant conveys is to be determined according to common law principles and Supreme Court decisions. The court then found that the common law and decisional rule is that a grant bounded by a non-navigable stream carries right and title to the center of the stream, absent a clear intention otherwise. Applying this rule to the treaties involved, the court found the defendants to be owner of the north half of the bed. (Hoffman-Florida)
W76-01979

NATURAL RESOURCES DEFENSE COUNCIL, INCORPORATED V CALLAWAY (ACTION TO REQUIRE CORPS OF ENGINEERS TO ISSUE REGULATORY DEFINITION OF 'WATERS OF THE UNITED STATES').
392 F Supp. 685-86 (D. District of Columbia, 1975). 2 p.

Descriptors: *Federal Water Pollution Control Act, *Watercourses(Legal aspects), *Navigable waters, *Administrative decisions, *Judicial decisions, Legislation, Water law, Regulation, Adjudication procedure, Federal jurisdiction, Legal aspects, Classification, United States, Federal government.
Identifiers: Judicial interpretations, Judicial definitions, Territorial seas, FWPCA Amendments of 1972.

Conservation groups brought this action against the Secretary of the Army, the Army Corps of Engineers, and the Environmental Protection Agency, protesting regulations issued defining 'navigable waters' under the Federal Water Pollution Control Act (FWPCA) as those which have been, are, or may be used for interstate or foreign commerce. Plaintiffs contended that defendants acted unlawfully and in derogation of their duties under the FWPCA in giving 'navigable waters' such a narrow definition. The court granted plaintiffs summary judgement, finding that Congress, by defining the term 'navigable waters' for purposes of the FWPCA Amendments to mean 'the waters of the United States, including the territorial seas', asserted federal jurisdiction over the nation's waters to the maximum extent permissible under the commerce clause. Thus, as used in the FWPCA, the term 'navigable waters' is not limited to the traditional tests of navigability. (Hoffman-Florida)
W76-01980

COMMITTEE TO SAVE LAKE MURRAY V. FEDERAL POWER COMM'N (DISCHARGE OF TREATED EFFLUENT INTO LAKE).
515 F 2d, 379-385 (DC Cir 1975), 7 p.

Descriptors: *South Carolina, *Easements, *Administrative agencies, *Public utilities, *Administrative decisions, *Federal power act, Legal review, Jurisdiction, Navigable waters, Permits, Lakes, Public lands, Legal aspects, Environmental effects, Dams, Public rights, Judicial decisions, Littoral.
Identifiers: Environmental impact statement, Navigable capacity, Public hearings, *Lake Murray(SC).

Petitioners, owners of a residence adjacent to a lake, sought review of an order of the Federal Power Commission approving the application of a public utility for an easement to allow a private developer to lay pipe along a lake bottom for the discharge of treated effluent. The Commission had jurisdiction over the lake since it was created by a dam on a river which has a future navigable capacity. The issues presented at trial were (1) whether the Commission acted within its statutory authority in granting the order, (2) whether the order was based upon substantial evidence, (3) whether an easement can be granted to a private developer; and (4) whether or not a public hearing should have been held prior to granting the easement. The court upheld the Commission's order, finding that the Commission had acted within its statutory authority as granted by Section 4 (e) of the Federal Power Act, and that the easement could be granted to a private developer since it would not shift the use of the lake from public to private use. The court held that public hearings were unnecessary and that the environmental impact statement prepared supported the Commission's decision. (Hoffman-Florida)
W76-01981

UNITED STATES V. SUNSET COVE (FILL MATERIAL DEPOSITED ON MIGRATORY SANDSPIT).
514 F 2d, 1089-1090 (9th Cir 1975), 2 p.

Descriptors: *Sandspits, *Land forming, *Riprap, *Bank stabilization, *Judicial decisions, Shoals, Sandbars, *Shallow water, Erosion control, Stream stabilization, Structures, Coasts, Legal review, Watercourse(Legal aspects), Permits, Environmental effects, *Oregon, United States.
Identifiers: *Sandspit stabilization.

Defendant developer had sought to stabiliz sandspit against further erosion and seaso movement by the emplacement of a riprap and filling and elevating the surface to create build sites. The lower court ordered removal of riprap, since it had been placed there without p mit and defendent appealed. The court of App found that, because of the seaonal movemen the channel and the migratory nature of the sh and sandbars within the area of its confluence the sea, the sandspit has a natural tendency to pand and retract up and down the coast. Thus, defendants attempts at stabilizing the sand would have effected permanent changes in river channel and its course. Such changes staturtorily prohibited without an Army Corp Engineers permit. As a result of these findings lower court decision was affirmed. The re granted was modified, however, so that the def dant was required to remove only as much of riprap as would permit nature, in a reasona period of time, to take its course and reestab former topographic conditions. (Hoffman-Flor
W76-01982

UNITED STATES V. ALASKA (STATUS AND TITLE TO COOK INLET).
95 S CT 2240-2253 (1975), 14 p.

Descriptors: *Alaska, *Bays, *Inlets, *Fede State Water Rights Conflicts, *Judicial decisio Legal review, Leases, Oil, Ownership of b Beds under water, Legal aspects, Governme interrelations, Water law, Beds, State gov ments, Boundary disputes, History.
Identifiers: Historic bays, Gas and Oil lea Sovereignty, *Cook Inlet(Alas).

The United States, contending that the lower i to Cook Inlet constituted high seas, brought against the State of Alaska to quiet title and to join Alaska from offering oil and gas leases sale in the area. The decision in favor of Ala was affirmed by the District Court, whereu this appeal was made to the Supreme Court. central issue was whether or not Cook Inlet i historic bay. If it is an historic bay, then the S has sovereignty over the subsurface lands; if not, then the United States has paramount rig To establish historic bay status the claiming na must have exercised continuous authority over area, and foreign states must have acquiesce the exercise of the authority. In reviewing Court of Appeals decision, the Court divided findings on the exercise of authority over the I into three time periods; that of Russian sovere ty, that of the United States sovereignty, and of Alaskan statehood. After reviewing evidence, the Supreme Court reversed, find that the evidence offered by the State was not ficient to establish historic title. (Hoffm Florida)
W76-01983

UNITED STATES V. INDEPENDENT BU TRANSPORT (OIL SPILL DAMAGES),
934 F Supp 1319-1324 (SD NY 1975), 6 p.

Descriptors: Federal Water Pollution Control *Judicial decisions, *Water pollution control, pollution, *Oil spills, United States, Governme Water pollution, Water law, Legal aspects, ministrative agencies, Oil, Water pollu sources, Penalties(Legal), Legislation, Adm trative decisions, Federal government.
Identifiers: *Federal Water Pollution Control Amendments of 1972, Evidence, Due process, ministrative law, Procedural law.

Plaintiff United States sued defendant ba owner to recovery civil penalties administrativ adjudged by the Coast Guard pursuant to

eral Water Pollution Control Act Amendments of 72, and imposed as a result of oil spills. Dur- ng pretrial discovery the government disclosed h the official Coast Guard record of the case o ained several items not previously shown or e ribed to defendant. These undisclosed matters ed a claim by defendant that it had been denied ts statutory right to 'notice and opportunity for a e ng'. The District Court agreed, holding that at h earing and upon administrative appeal the de- ant had a fundamental right to confront fac- u natters and contentions that were, or might be e ed adverse to its position. Defendant should ls have been afforded an opportunity to be eft in rebuttal. The court further ruled that the r edural deficiencies could not be cured by a de o hearing before the court itself, since the ulti- a decision was one for administrative discre- io (Schilling-Florida)
V -01984

ULIX SUPER MARKETS, INC V PEARSON FLING OF WATER FILLED PHOSPHATE T).
I o 2d, 98-101, (2d DCA Fla 1975), 4 p.

D riptors: *Florida, *Riparian rights, *Non- a gable waters, *Artificial lakes, *Land recla- n on, Water Water law, Legal aspects, Common a Lakes, Lake beds, Lake shores, Riparian a Water rights, Artificial watercourses, Ripari- n aters, Landfills, Judicial decisions, Owner- h of beds, Real property, Phosphates.
d tifiers: *Phosphate pits, Injunctive relief.

P tiffs, the owners of homes bordering on water f d phosphate pits, brought suit to prohibit de- e ant, corporate owner of a portion of such pits, r reclaiming and filling those pits located on its a Finding that defendant's proposed actions v d significantly impair the use and enjoyment o e entire surface water of the phosphate pits h rial court granted a temporary injunction. On n locutory appeal, the District Court of Appeal e rsed, holding that the phosphate pits were not u ect to the same raparian rights as natural, non- g gable lakes. The court also ruled that the prin- i allowing reasonable use of an entire non- g gable, natural lake by all individuals owning a s of the lake bed does not extend to artificial a . Since the phosphate pits were not encircled p subsivision, and had not been dedicated to e ational use by means of restrictive deeds, p tiff landowners had no riparian rights such as n s of restrictive deeds, plaintiff landowners a riparian rights such as those which accrue on a ral, non-navigable lakes. Thus defendant had h ight to fill and reclaim those portions of the p phate pits to which it had legal title. (Schilling- ida)
W -01985

OD PREVENTION - CITIES OF 10,000 TO 400.
na Ann Stat Sec 48-5063 (supp 1972) 2p.

D riptors: *Indiana, *Flood control, *Water - ly, *Cities, *Classification, Legislation, d protection, Public health, Administration, l aspects, Flood data, Penalties(Legal), Pro- ns, Floodwater.

S orth in this statute are laws now applicable for i s that had previously operated under the F d Control Act of Fifth Class Cities which was e aled in 1965. If no action is taken by the com- n council on any city with a population between 0 0 to 14,000 than that city shall administer its d control program pursuant to an act entitled A act to prevent floods and protect cities of the e nd, third, fourth and fifth classes, and incor- p ted towns, from inundation from flood y rs'. The council of any city, however, has the p n of administering its program under an act r led 'An act concerning flood control districts, d claring an emergency.' (Hoffman-Florida)
W -01986

WATER CONTROL (REGULATING POLLUTION AND DISCHARGE OF UNTREATED WASTES INTO MISSISSIPPI RIVER).
La Rev Stat secs 56:1431 thru 56:1463 (Supp 1973), 5p.

Descriptors: *Louisiana, *Water pollution control, *Aquatic habitats, *Mississippi River, Water pollution, Legislation, Water quality control, Pollutants, Water quality standards, Water pollution effects, Penalties(Legal), Law enforcement.
Identifiers: Statutory penalties.

Chapter 3, Water Control, establish a Stream Control Commission of Louisiana which is authorized to issue orders and regulations to provide protection for the various water bodies and aquatic life within the state. The Commission is authorized to bring civil actions against any person who negligently or willfully causes pollution of state waters in such concentration as to render the water unfit for maintenance of normal fish or aquatic life characteristics. Chapter 3 also prohibits the knowing discharge of any substance into a state water body which results in pollution. Standards are set up for determining what constitutes water pollution, and provides civil penalties for anyone who transcends them. The chapter specifically prohibits the discharge of any untreated waste into any public body of water in the state. It also provides that any discharged waste shall receive the best practical secondary treatment or its equivalent. Otherwise the offender will be liable for a statutory penalty for each day during which the violation occurred. (Hoffman-Florida)
W76-01987

CITIES SERVICE COMPANY V. STATE OF FLORIDA (ACTION BY STATE FOR DAMAGES AND INJUNCTIVE RELIEF ARISING OUT OF BREAK IN DAM IMPOUNDING PHOSPHATE SLIME).
312 So 2d 799-804 (2d District Court of Appeal of Florida, 1975), 5 p.

Descriptors: *Phosphates, *Florida, *Dam failure, *Fishkill, *Settling basins, Judicial decisions, Legal review, Penalties(Legal), Disasters, Reservoirs, Water pollution sources, Water pollution effects, Water pollution, Land use, Accidents, Water quality control, Rupturing, Damages.
Identifiers: Strict liability.

In 1971 a dam break occurred in one of appellant's settling ponds operated in conjunction with its phosphate mine. As a result, approximately one billion gallons of phosphate slimes contained therein escaped into state waters, killing countless numbers of fish and inflicting other damage. The state subsequently filed suit seeking adjunctive relief as well as compensatory and punitive damages arising out of the dam break. The trial court struck the claim for punitive damages but granted the state's motion for partial summary judgement on liability. The premise of the order was that the defendant was liable without regard to negligence or fault for the damage occurring by reason of the escape of the phosphate wastes into state waters. On appeal, the court affirmed the lower court decision. The Court of Appeal held that the doctrine of strict liability for damage resulting from the non-natural use of land should apply in Florida and that a phosphate slime reservoir constitutes such a non-natural us of land. (Hoffman-Florida)
W76-01988

FALCO V. JAMES PETER ASSOCIATES, INC. (ACTION BY CONTINGUOUS LANDOWNERS FOR DAMAGES AND INJUNCTIVE RELIEF ARISING OUT OF ALLEGED CHANGE OF NATURAL FLOW OF SURFACE WATER).
335 A 2d, 301-303, (Sup ct Conn 1973), 3 p.

Descriptors: *Connecticut, *Judicial decisions, *Real property, *Damages, *Surface drainage, *Land fill, Retaining walls, Penalties(Legal), Damages, Legal aspects, Land appraisals, Value, Property value, Salvage value, Economic impact, Flow, Repairing, Replacement costs, Surface waters, Surface runoff, Value.
Identifiers: Natural water flow.

Defendant property owners' predecessor in title had erected an apartment complex requiring extensive landfill. This landfill altered the natural flow of water, causing water to flow onto plaintiffs' land instead of away from it. At trial the state referee found defendants had maintained their premises so as to continue damaging plaintiffs' land. He found that a solution to the problem would be the construction of a retaining wall and a French drain; that the cost of the wall and drain would be $9000; and that plaintiffs were entitled to a judgement for the amount plus $100 nominal damages. The measure of damages, the court said, should be the dimunition in value determinable from the cost of repairing damage. Such cost may neither exceed the former value of the land nor enhance the value of the property over what it was before damage occurred. In this case no evidence was shown concerning the prior value of the plaintiffs' land. Furthermore, before damages can be awarded, it must be shown that defendants had been given notice of the condition and had refused to correct it. (Hoffman-Florida)
W76-01989

SOCIETY FOR PROTECTION OF NEW HAMPSHIRE FORESTS V. SITE EVALUATION COMMITTEE (APPEAL BY GROUP OPPOSING LOCATION OF NUCLEAR GENERATING FACILITY ALLEGING ADVERSE AFFECT ON WATER QUALITY).
337 A2d 773-90 (Supreme Court of New Hampshire, 1975), 8 p.

Descriptors: *New Hampshire, *Nuclear power plants, *Sites, *Administrative agencies, *Administrative decisions, Land use, Regulation, State governments, Adjudication procedure, Environmental effects, Thermal pollution, Judicial decisions, Water management(Applied), Water policy, Administration, Permits, Legal aspects.
Identifiers: Administrative findings, Subdelegation(Administrative agencies).

Opponents of a nuclear generating facility appealed from the decision of the site evaluation committee, a state administrative agency, approving the location of a facility in Seabrook, New Hampshire. Two of the issues presented were: whether the committee subdelegated its duty to ascertain the impact on water quality by the proposed facility's dishcarge of cooling water in violation of a state statute; and whether the findings of the committee were legally sufficient. The court found that no subdelegation had occurred since the site evaluation committee and the water supply and pollution control commission each fulfilled separate but coordinated functions in the authorization of the Seabrook site. As to the legal sufficiency of the findings, however, the court remanded the case for the purpose of requiring the site evaluation committee to provide basic finding of fact on the existing record to support the ultimate conclusions it has reached. The court found that where the need for new sources may adversely affect the environment, the determination of whether administrative findings are sufficient entails weighing the competing value of administrative efficiency against the need for deliberate and considered decision making. In this case, considered decision making was found to require the production of basic findings of fact. (Hoffman-Florida)
W76-01990

ULLIAN V. CULLEN (APPEAL FROM DECISION RESTRAINING OBSTRUCTION OF A WATERCOURSE CARRYING FLOW OF SUR-

FACE WATER FROM ADJOINING PROPERTY).
325 NE2d 593-97, (Appeal Court of Massachusetts, 1975), 5 p.

Descriptors: *Watercourses(Legal aspects), *Surface drainage, *Surface runoff, *Massachusetts, *Natural streams, Culverts, Judicial decisions, Legal review, Landfills, Penalties(Legal), Floods, Developed waters, Outlet works, Conveyance structures, Adjacent land owners, Easements, Artificial watercourses, Rainfall-runoff relationships.

Defendants, during a landfill operation, blocked a culvert opening located on their property. Following the blockage of the culvert, water backed up from the area near the culvert and flooded parts of plaintiff's property. At trial, a master found that the culvert had constituted a well-defined watercourse. The trial judge confirmed the master's report and entered a decree ordering defendants to unblock and reconstruct the alleged watercourse and to grant plaintiff an easement to maintain the watercourse as reconstructed. On appeal, the Appeals Court found that the master's report contained no finding as to the source of the alleged waterflow other than the drainage of surface water from adjoining property. For a culvert to be a natural watercourse it must appear that to be something more than an artificial ditch for carrying off surface water and draining the land through which it passes. The court found no such evidence in the master's report. Thus the decree was reversed, and the case remanded. (Hoffman-Florida)
W76-01991

MARINE POLLUTION-PREVENTION-WASTES, ETC.
PL 93-254; 88 stat 50, US Code Cong and Admin News, p 49-50, 1974, 2 p.

Descriptors: *Transportation, *Oceans, *Waste disposal, *Water pollution sources, *Ships, Water pollution, Legislation, Water pollution control, Pollutants, Water quality control, Abatement, Solid wastes, Ultimate disposal, Wastes, United States, Foreign countries, Navigation.
Identifiers: *Territorial sea.

This Act amends the Marine Protection, Research, and Sanctuaries Act of 1972, in order to implement the provisions of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. These amendments provide that the purpose of the 1972 Act is to regulate: (1) the transportation by any person of material from the United States and, in the case of United States vessels, aircraft, or agencies, the transportation of material from a location outside the United States, when in either case the transportation is for the purpose of dumping the material into ocean water; and (2) the dumping of materials transported by any persom from a location outside the United States, if the dumping occurs in the territorial sea or the contiguous zone of the United States. Also presented are various other technical amendments to the 1972 Act. (Hoffman-Florida)
W76-01992

BURGESS MINING AND CONSTRUCTION CORPORATION V. STATE EX REL BAXLEY (ACTION BY STATE FOR DAMAGES RESULTING FROM MINING COMPANY'S ALLEGED POLLUTING OF RIVER).
312 So 2d 842-48 (Civil Appeals of Alabama, 1975), 7 p.

Descriptors: *Alabama, *Mine wastes, *Water quality standards, *Judicial decisions, *Permits, Legal aspects, State jurisdiction, Administrative agencies, Regulation, Water pollution sources, Industrial wastes, Environmental effects, Aquatic life, Penalties(Legal), Waste water treatment, Rivers, Recreation.

The State brought an action to recovery civil penalties from defendant mining company which was allegedly polluting a river without first obtaining a permit. From a judgement in favor of the State, the defendant appealed. Defendant contended that there was insufficient evidence of the pollution charge to sustain the verdict, since there was no showing that the defendant violated any standard established by the Alabama Water Improvement Commission. The court rejected this contention, noting that the complaint against defendant was not for a violation of water quality standards but for the pollution of the river without a permit. The court ruled that defendant had discharged matter into the river without a permit and that such material was pollution as defined by Alabama Water Improvement Act, and was harmful to aquatic life and detrimental to the recreational use of the river. Thus, it was not necessary for the State to introduce proof showing violations of water quality standards set by the Commission. The court noted, however, that evidence offered to show compliance with established criteria of water standards would have been a defense to the charge of pollution. (Hoffman-Florida)
W76-01993

WARNER V. REPLINGER ('BAY' DEFINITION).
397 F Supp 350-60 (DRI 1975), 11 p.

Descriptors: *Northeast U.S., *Bays, *State jurisdiction, *Federal jurisdication, *International waters, Legal aspects, Legal review, Inlets(Waterways), Federal-state water rights, Conflicts, Navigable waters, Administrative agencies, Water rights, Coasts, Ajudication procedure, Judicial decisions, Federal government, State governments.
Identifiers: Administrative regulations, Coastal waters, Licenses, Standing(Legal).

Plaintiffs, Connecticut pilots, sought declaratory and injunctive relief challenging a Rhode Island statute requiring pilots in Block Island Sound to have Rhode Island licenses. Plaintiffs contended that the Congressional test for a 'bay', in which the area of the bay is compared to the area covered by a semi-circle whose diameter is equal to the entrance points to the bay, established that Block Island Sound did not constitute a bay and therefore should not be regulated by the Rhode Island statute. Plaintiffs further contended that ship routes in the Sound lay more than three miles off shore, and thus beyond state authority. In denying the plaintiffs their requested relief, the District Court noted that there is no question of the federal government's control over navigable waters and that by statute the federal government has delegated regulations of certain navigable waters to the states. The Court also held that Block Island Sound is a 'bay' within the federal statutes granting states authority to regulate pilots in bays. (Gray-Florida)
W76-01994

NATURAL RESOURCES DEFENSE COUNCIL, INC. V. TRAIN (FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS).
396 F Supp 1386-93 (District of Columbia 1975), 8 p.

Descriptors: *Federal Water Pollution Control Act, *Comprehensive planning, *Governmental interrelations, *Water quality control, *Water pollution sources, Nonstructural alternatives, State jurisdiction, Administrative decisions, Administrative agencies, Management, Administration, Water law, Legal aspects, Jurisdiction, Judicial decisions, Coordination, Legal review.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Point sources of pollution, Non-point sources of pollution.

Plaintiff environmental groups brought suit against the Administrator of the Environmental Protection Agency (EPA) seeking declaratory and injunc relief concerning the interpretation of var provisions of the Federal Water Pollution Con Act Amendments of 1972. Under applicable pr sions of the Act, several governmental units the authority to designate areas within a s which have substantial water quality co problems. The major issue concerned what the state governments were to play in plan water quality control programs in non-desig areas. Plaintiffs contended that the states' d were the same in both designated and designated areas that is to develop a plan to trol point and non-point sources of pollu Furthermore, strict time limitations for pliance with the Act would be applicable to states. Intervening defendant forest products pany, however, contended that the Act m required the states to engage in general, di tionary planning, thus exempting them from tain time limitation requirements. After trial o merits, the district court found that the requires the states to develop comprehen planning for both designated and non-design areas alike. Thus, the court found certain regulations pertaining to non-designated area be invalid, and ordered the agency to promu new regulations consistent with the opi (Hoffman-Florida)
W76-01995

UNITED STATES V. SEA GATE, INC PORATED (BINDING EASEMENT IN FA OF GOVERNMENT IN THE USE OF LAND JOINING ATLANTIC INTERCOAS WATERWAY).
397 F Supp 1351-61 (D North Carolina, 1975), 1 map.

Descriptors: *Easements, *Land *Construction, *Land development, *Dred Land tenure, Reasonable use, Competing Land management, Land, Channels, Canal bankments, Judicial decisions, Legal asp Non-structural alternatives, United St Federal government, Real property.
Identifiers: *Atlantic Intercoastal Wate Laches, Set-back restrictions.

Plaintiff United States had obtained an ease in 1957 giving it the right to use lands adjoinin Atlantic Intercoastal Waterway for purposes sistent with the operation and maintanance Waterway. This action was brought in 1974 join the defendant developer from constructi sidential subdivisions on both banks of the W way. After reviewing the evidence, the found that the easement was binding on the d dants, since the easement had been duly reco and since the defendants had full knowledge easement before they brought the land. The also found that the government was not est from maintaining the action, as the defendant contended, even though it had not prevented struction on other easement lands along the W way. In so holding the court relied upon a Sup Court decision that held laches was no defens suit by the government to protect a public The court held, however, that it would not b reasonable to allow the construction on the bank only, provided that prescribed set restrictions were followed. The court noted the enjoining of construction on the east would give the government adequate spac dredging and other operations necessary to imize the utility of the waterway. (Hof Florida)
W76-01996

PECK V. SHARROW (DOWNCREEK OWN PRIMA FACIE RIGHT TO USE TO 1.0 C FOOT OF WATER PER SECOND).
531 P2d 1157-61 (Idaho 1975), 5 p.

Descriptors: *Idaho, *Water rights, *Wate mits, *Relative rights, *Riparian rights, Lic

rian waters, Water, Water law, Legal aspects, , Flow measurement, Flow rates, Bodies of r, Water supply, Prior appropriation, Priori- Judicial decisions.
tifiers: Evidence, Injunctive relief.

tiff downcreek owners brought action to en- defendant upcreek from interfering with their s to use waters from the creek. The trial court d that plaintiffs held two valid water licenses h entitled them to 1.0 cubic foot of water per nd. The trial court found further that defen- s had a right to use 0.16 cubic feet of water per nd. Although defendants established that r had been diverted to their property prior to ime of plaintiffs' water licenses, the trial court d that they failed to establish such a prior use application as to given them a right prior to tiffs'. The Supreme Court of Idaho in affirm- uled that the trial court's findings were sup- ed by substantial and competent evidence. tiffs' water licenses established a prima facie to use of waters from the creek. The court held proper the trial court's order requiring ndants to utilize a measuring device to avoid rting water when the creek flow was less than ubic foot. (Schilling-Florida)
-01997

PER V. LUNDVALL (DEFINING GROUND- TER AS NON-TRIBUTARY IN ARACTER).
P2d 1328-33 (Colorado 1975), 6 p.

criptors: *Colorado, *Constitutional law, ter rights, *Groundwater, Groundwater ement, Groundwater resources, Water, Water Legal aspects, State governments, Adminis- ve agencies, Surface waters, Surface-ground- r relationships, Water wells, Streams, Tribu- s, Judicial review, Judicial decisions.
tifiers: *Colorado Ground Water Management Injunctive relief.

ntiff State Engineer brought suit to enjoin de- lant landowner from transporting water from ndant's wells to a portion of his lands other those designated to be irrigated by the well r. Defendant counterclaimed, seeking injunc- relief and a declaration that the Colorado und Water Management Act was unconstitu- al. The trial court entered judgement for de- lant, ruling that the Act violated articles of the rado Constitution governing the water of ams. The Supreme Court of Colorado rsed, holding that since the groundwaters in stion would not reach a stream for over a cen- , they were not part of the surface stream as templated by the state Constitution. The court her held that the Act did not violate the Con- tion by granting to an administrative agency power to make an initial determination of r rights, and the power to grant or refuse per- to drill wells. (Schilling-Florida)
-01998

MMONWEALTH, DEPARTMENT OF HWAYS V. JENT (NO LOSS OF REASONA- ACCESS TO HIGHWAY BECAUSE OF ANGE IN SURFACE WATER DRAINAGE).
SW2d 121-123 (Ky Ct App 1975), 3 p.

criptors: *Kentucky, *Highway effects, ainage effects, *Surface waters, oundwater, Groundwater movement, inage, Drainage area, Construction, Ditches, ess routes, Properties, Property values, Right- vay, Legal aspects, Legal review, Drainage erns(Geologic), Damages, Judicial decisions.
tifiers: Nuisance, Proximate causation, hway access.

ntiff landowners brought an inverse con- nation proceeding claiming that construction onnector roads by defendant, Department of hways, had altered surface water drainage on their property and deprived them of reasonable access to the highway. Plaintiffs also contended their properties had been directly damaged by water flow, deminishing its value. In reversing a trial court decision for plaintiffs, the Court of Appeals of Kentucky noted that property owners who allege a decrease in property value due to construction-caused water flow must offer proof of the resulting damages, even if it is conceded that negligent construction caused the water flow. Furthermore, the lack of access to highways on infrequent occasions does not constitute a loss of reasonable access. (Gray-Florida)
W76-01999

WERNBERG V. STATE (COMPENSATION FOR OBSTRUCTION OF RIPARIAN PROPRIETOR'S ACCESS TO INLET).
519 P2d 801-804 (Alaska, 1974), 4 p.

Descriptors: *Alaska, *Access routes, *Judicial decisions, *Riparian rights, *Condemnation, Streams, Inlets, Navigable waters, Water rights, State jurisdiction, Constitutional law, Regulation, Legal review, Legal aspects, Riparian land, Littoral.
Identifiers: *Littoral rights.

Plaintiff landowner had sought damages from the state in an inverse condemnation suit for the obstruction of a riparian proprietor's access from a creek to an inlet. After the trial court dismissed the complant, plaintiff appealed to the Alaska Supreme Court. In reversing, the court rejected the state's argument that there was no private littoral right to use public waters for navigation. The Court also rejected an argument that the right to limit littoral access, given to the state by the Alaska Constitution, constituted regulation. After this decision, the state filed a petition for rehearing, contending that the Court had misinterpreted the state's second argument. In denying the rehearing, the Court held that it had not misinterpreted the argument, since it agreed that the state had the right to limit a private littoral right of access. However, the Court also found that the limiting of the access was a taking, and not regulation. Thus, the award of damages was justified. (Hoffman-Florida)
W76-02000

6F. Nonstructural Alternatives

ANALYSIS OF THEORIES AND METHODS FOR ESTIMATING BENEFITS OF PROTECTING URBAN FLOOD PLAINS,
Washington Univ., St. Louis, Mo., Inst. for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W76-01595

CONVENTIONAL WISDOM PLUS A NEW PHILOSOPHY--CORPS OF ENGINEERS WATER RESOURCE PLANNING,
For primary bibliographic entry see Field 6E.
W76-01598

FLOOD MANAGEMENT DECISIONMAKING IN THE CONNECTICUT RIVER BASIN: ANALYSIS OF THE EXISTING LEGAL, FINANCIAL AND INSTITUTIONAL FRAMEWORK FOR FLOOD PLAIN MANAGEMENT,
Meta Systems, Inc., Cambridge, Mass.
D. Smith, and S. Robinson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB238-998, $5.00 in paper copy, $2.25 in microfiche. Prepared for New England River Basins Commission, Boston, Mass. 303 p, 7 fig, 3 tab, 15 ref. CRSS-NERBC 1.3F, 1.5F, 1.6F. NERBC 1.3F, 1.5F, 1.6F.

Descriptors: Water resources, *Connecticut River, *Flood control, *Non-structural alternatives, *Water management(Applied), *Governments, *Governmental interrelations, *Decision making, Flood protection, Water policy, Wetlands, Vermont, New Hampshire, Connecticut, Massachusetts, *Connecticut River.
Identifiers: Flood management, St. Johnsbury(Vermont), Keene(New Hampshire), Northampton(Mass), Flood plain management, Flood management institutions, Flood management laws, Flood management financing, Inland Wetlands Act, Open planning.

Observations of the existing financial, legal, and institutional mechanisms for flood management decisionmaking in the Connecticut River Basin as well as discussion of interest groups' influence on and interaction with these mechanisms are presented. A set of uniform legal, financial and institutional criteria for evaluating alternative flood management processes is proposed. The flood management decisionmaking structure and process for each state in the Basin, Massachusetts, Vermot, Connecticut, and New Hampshire, is discussed in relation to the state's legislative process and statutory foundation. Section 2 contained 3 case studies which examine the interest groups, local and regional agencies, geographical and historical characteristics, and political controversies unique to each community. The current role of the federal government in regional flood management is also discussed. To incorporate the range of interests into the analysis of flood management alternatives, some formal methodologies are surveyed. Some conclusions are: (1) Flood management is not an important factor in municipal decisionmaking at present in the Connecticut Basin. (2) Communications between local groups who often have a vast store of valuable knowledge and state and federal agencies are inadequate. (3) Biases of state and federal agencies and financial restraints interfere with rational planning. (Salzman-North Carolina)
W76-01599

PERFORMANCE CONTROLS FOR SENSITIVE LANDS: A PRACTICAL GUIDE FOR LOCAL ADMINISTRATORS,
American Society of Planning Officials, Chicago, Ill.
C. Thurow, W. Toner, and D. Erley.
Environmental Protection Agency, Report EPA-600/5-75-005, March 1975. 523 p, 25 fig. 1HA098; 21 AKL 25. R802443.

Descriptors: *Land use, Control, Data collections, Environment, Water resources, *Planning, Analytical techniques, *Performance, Administration.
Identifiers: *Planning controls.

This report is to be used as a handbook by local planning officials in planning for and regulating the use of five distinct natural areas: streams and creeks, wetlands, woodlands, hillsides, and groundwater and aquifer recharge areas. Each section is devoted to the discussion of local regulation of land use in areas identified as 'sensitive'; and each area is discussed in terms of its ecology and value to the public, current regulatory practices, and recommended programs for regulating the area. Also included are appendices showing where and how to go about getting technical assistance from existing governmental agencies and examples of local ordinances for protecting the environmentally sensitive areas. The final section is a monograph on environmental performance standards, the result of a preliminary study on the feasibility of extending the performance standard concept used in industry to regulation of the environment. Its purpose is to explore this possibility and to suggest new areas for research. (EPA)
W76-01871

6G. Ecologic Impact Of Water Development

AMES RESERVOIR ENVIRONMENTAL STUDY, SUMMARY REPORT.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 4A.
W76-01522

WASHINGTON'S WATERFRONT LESSON,
North Carolina Univ. at Chapel Hill. Dept. of Fine Arts.
For primary bibliographic entry see Field 6B.
W76-01596

MANAGING THE ENVIRONMENT,
Environmental Protection Agency, Washington, D.C.
R. M. Laska, and J. Gerba.
Available from the National Technical Information Service, Springfield, Va 22161, as PB238-062, $10.75 in paper copy, $2.25 in microfiche. November, 1973, 386 p, 31 fig, 17 tab. EPA-600/5-73-010.

Descriptors: *Environmental control, *Legal aspects, *Political aspects, *Planning, *Governmental interactions, *Comprehensive planning, *Social aspects, Pollution, Administration, Decision-making, Ecosystems, Data.
Identifiers: Environmental management, Environmental standards, Environmental impact statements, Ecology, Residuals, Federal environmental functions, Citizen control, Environmental Protection Agency(EPA).

For environmental policies to be effective, environmental management has to integrate knowledge from a variety of fields and disciplines including government, industry, business, economics, ecology and the general public. Contained in this report are 42 articles covering the full range of environmental management issues. These papers examine the environmental issues from varied perspectives and discuss techniques for citizen participation, management information systems, organizational structures, special regulatory procedures and controls, legal actions and other strategies for improving the environment. Several strategies explored include land use planning, environmental impact statements, and environmental standards and laws. One section examines intergovernmental relations in managing the environment. Three conclusions are reached: the shortcomings of present environmental management techniques are recognized by decision-makers at all levels of authority, sophisticated environmental concepts are found to be non-operational by the local managers, and successful management techniques are not exchanged by communities. For more effective environmental management, more emphasis should be placed on human aspects, managerial and technical assistance must be provided to implement environmental mandates at local level, and sophisticated tools already created must be molded into a more easily transferable form in order to be effective. (Salzman-North Carolina)
W76-01597

ENERGY--ENVIRONMENT.
Ballinger Publishing Co., Cambridge, Mass.
For primary bibliographic entry see Field 6B.
W76-01620

POSSIBLE IMPACTS OF OIL SHALE DEVELOPMENT ON LAND RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5C.
W76-01691

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 1, EFFECT OF THE 'REVIEW AND COMMENT PROCESS' ON THE CORPS OF ENGINEERS AND SOIL CONSERVATION SERVICE,
Stanford Univ., Calif. Dept. of Civil Engineering
For primary bibliographic entry see Field 6B.
W76-01800

NEPA'S INFLUENCE ON FEDERAL WATER PLANNING: PART 2, CASE STUDIES OF CORPS OF ENGINEERS' PLANNING IN CALIFORNIA,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-01801

THE WILLAMETTE RIVER GREENWAY: CULTURAL AND ENVIRONMENTAL INTERPLAY,
Oregon State Univ., Corvallis. Dept. of Anthropology.
W. D. Honey, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 554, $6.00 in paper copy, $2.25 in microfiche. Oregon Water Resources Research Institute, Corvallis, Report WRRI-35, September 1975. 133 p, 18 fig, 31 tab, 88 ref, 2 append. OWRT B-023-ORE(5).

Descriptors: *Water quality, *Oregon, Ecology, Environmental effects, *River basin development, Technology.
Identifiers: *Cultural-ecological systems, Industrial-urban technology, *Willamette River Greenway(Ore).

The Willamette River Basin, Oregon, viewed in terms of a cultural-ecological systems, has been subject to three phases of cultural development: hunting and gathering, agrarian, and industrial-urban. Each population base has employed a technology to exploit the environment to the extent that its patterns of culture would allow. This technology has been oriented towards one relevant resource within the ecological system--the Willamette River. The environmental quality of the Willamette River began to show signs of impairment with the onset of the industrial-urban development, and the use of a more sophisticated technology. Only through the efforts of a few concerned citizens did the quality of the water begin to improve by the mid-Twentieth Century. The Willamette River Greenway as a governmental response to renew the relevant resource of the cultural-ecological system. Public attitudes toward the Greenway indicate that basin residents feel industrial-urban technology should be utilized to renew the Willamette River, allowing it to once again become the cultural focal point of the ecological system.
W76-01805

ACTIVITIES AND NEEDS RELATED TO RADIOACTIVITY STANDARDS FOR ENVIRONMENTAL MEASUREMENTS.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W76-01861

IN MEMORIAM: RAINBOW BRIDGE NATIONAL MONUMENT,
F. Hannay.
Ecology Law Quarterly, Vol 4, No 2, p 385-414, 1974. 29 p, 130 ref.

Descriptors: *Judicial decision, *National monuments, *National parks, *Dams, *Reservoirs, Erosion, Preservation, High water mark, Arizona, Utah, Sulfur, Powerplants, Arid lands, Structural stability, Structures, Legal aspects, Water resources development, Water level fluctuation, Desert plants, Deserts, Water storage, Arid climates.
Identifiers: *Rainbow Bridge National Monument, *Colorado River Storage Project Act, *Glen Canyon/Lake Powell Project, Congressional Acts, Bathtub ring(Reservoirs).

The nature and possibly the very existence of Rainbow Bridge National Monument has been affected by the decision of the Tenth Circuit in Friends of the Earth v. Armstrong. The decision allows the waters dammed by the Glen Canyon/Lake Powell Project to invade the monument's natural arid environment, despite the 1956 Colorado River Storage Project which specifies that no dams or reservoirs will be constructed within any national park or monument. The court gave as a reason for its ruling that the provisions of the Act had been overruled by implication and need no longer be adhered to. The author argues that the intent of Congress should be determined by Congressional action and not by judicial interpretation, especially where the decision will set a precedent for future judicially sanctioned encroachments on the National Parks and Monuments creasted by Congress. (Parrish-Florida)
W76-01953

THE FUTURE OF ENVIRONMENTAL DEFENSE,
Environmental Law Inst., Washington, D.C.
F. R. Anderson, and A. Rosencranz.
American Bar Association Journal, Vol 61, p 316-320, March 1975. 5 p.

Descriptors: *Environmental control, *Legal aspects, *Comprehensive planning, *Regulation, *Future planning(Projected), Projections, Adoption of practices, Construction, Federal Water Pollution Control Act, Legal review, Legislation, Pollution abatement, Judicial decision, Administrative agencies, Long-term planning, Environmental engineering.
Identifiers: *Environmental litigation, *Alaska Pipeline, *Energy policies.

Environmentalists are starting to re-evaluate the role of lawsuits in environmental defense. While such litigation has been primarily responsible for redesigning, delaying, and stopping numerous projects, the success or failure of legal challenges has too often depended on technicalities, rather than on the merits of the activities challenged. Thus there is a recognized need for implementation of comprehensive land use and energy policies. In the absence of such policies, environmental lawyers must employ non-litigative strategies, such as conferring with administrative officials, reviewing and commenting on proposed environmental regulations, and marshalling public opinion at state and local levels. These lawyers generally keep away from the legislative process, since most environmental groups have tax-exempt status under the Internal Revenue Code. The problem with these nonlitigative areas is that lawyers are accustomed to working on a case by case basis, and often do not collaborate enough to prevent duplication of effort, much less to build a coalition and establish a joint strategy. Even so, various methods and techniques are already available or being developed to aid environmental lawyers desiring broad social change under a defined national strategy. (Hoffman-Florida)
W76-01961

CAN NEW YORK'S WETLANDS BE SAVED. A CONSTITUTIONAL AND COMMON LAW SOLUTION,
For primary bibliographic entry see Field 6E.
W76-01964

CRIMINAL PROSECUTION UNDER THE ALASKA ENVIRONMENTAL CONSERVATION ACT OF 1971: STOCK V STATE,
For primary bibliographic entry see Field 5G.
W76-01967

ARD AN INTERNATIONAL STANDARD
NVIRONMENT,
getown Univ., Washington, D.C. School of

rimary bibliographic entry see Field 6E.
01970

I CONCLUDES WATER ACT ENFORCE-
T STUDY.
rimary bibliographic entry see Field 5G.
01972

ETY FOR PROTECTION OF NEW
PSHIRE FORESTS V. SITE EVALUATION
MITTEE (APPEAL BY GROUP OPPOSING
ATION OF NUCLEAR GENERATING
LITY ALLEGING ADVERSE AFFECT ON
ER QUALITY).
rimary bibliographic entry see Field 6E.
01990

ESOURCES DATA

Network Design

VIEW OF STATISTICAL PROCEDURES
FOR EXAMINATION OF WATER DATA,
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Gross.
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ervice, Springfield, Va 22161 as PB247-104,
in paper copy, $2.25 in microfiche. Mas-
setts Water Resources Research Center,
rst, Publications No 58, Completion Report
6, April 1975, 16 p, 2 ref.

riptors: *Water quality, *Bibliographies,
stical methods, Data collections, Reviews,
series analysis, *Regression analysis,
odology.

urpose is to review conventional statistical
ods which are currently in use in the analysis
ter quality data. The report focuses on 45 ar-
containing statistical methodology that have
published in the last ten years. In reviewing
ticles the method of annotated bibliographies
d in order that readers can ascertain specific
rch approaches. The journals covered in this
v are: Journal of the Water Pollution Control
ation, Water Resources Bulletin, Journal of
nitary Engineering Division, Proceedings of
merican Society of Civil Engineers, Biomet-
and Journal of the American Statistical As-
ion. In addition, selected reports by various
resources research groups throughout the
ry were covered. Use of time series analysis
gression techniques was predominant.
01509

G-TERM STREAMFLOW RECORDS
ONSTRUCTED FROM TREE RINGS,
na Univ., Tucson. Lab. of Tree-Ring
rch.
rimary bibliographic entry see Field 2B.
01708

Data Acquisition

LUATION OF SATELLITE REMOTE
ING AND AUTOMATIC DATA
NIQUES FOR CHARACTERIZATION OF
LANDS AND COASTAL MARSHLANDS,
nal Space Technology Lab. Bay St. Louis,
Earth Resources Lab.
Cartmill.
able from the National Technical Informa-
ervice, Springfield, Va 22161, as N75-133 44,
in paper copy, $2.25 in microfiche. ERL Re-
28, July 1974. 127 p, 24 fig, 6 tab, 18 ref, 3 ap-

Descriptors: *Remote sensing, *Wetlands, *Coastal marshes, *Louisiana, Data processing, Automation, Satellites(Artifical), Aerial photography, Land forming, Vegetation, Aquatic plants, Forests, Water quality, Environment.
Identifiers: *ERTS, Pattern recognition, Species identification.

The evaluation was conducted in a humid swamp and marsh area of southern Louisiana. Earth Resources Technology Satellite (ERTS) digital multispectral scanner data was compared with similar data gathered by intermediate altitude aircraft. Automatic data processing was applied to several data sets to produce simulated color infrared images, analysis of single bands, thematic maps, and surface classifications. These products were used to determine the effectiveness of satellites to monitor accretion of land, locate aquatic plants, determine water characteristics, and identify marsh and forest species. The results showed that to some extent all of these can be done with satellite data. It was most effective for monitoring accretion and least effective in locating aquatic plants. The data sets used showed that the ERTS data is superior in mapping quality and accuracy to the aircraft data. However, for some applications requiring high reaolution or maximum use of intermittent clear weather conditions, data gathering by aircraft is preferable. Data processing costs for equivalent areas were about three times greater for aircraft data than ERTS data, primarily because of the larger volume of data generated by the high resolution aircraft system. (Sims-ISWS)
W76-01531

SATELLITE RELAY AND PROCESSING OF HYDROLOGIC DATA IN SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
E. T. Wimberly.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 784, $3.25 in paper copy, $2.25 in microfiche. Water-Resources Investigations 12-75, 1975. 19 p, 9 fig, 11 ref.

Descriptors: *Remote sensing, *Hydrologic data, *Satellites(Artificial), *Florida, *Data transmission, Rainfall, Water levels, Telemetry, Data collections, Watershed management.
Identifiers: *Real-time data, NASA, LANDSAT, Big Cypress Swamp(Fla), Everglades.

A Data Collection System (DCS), using the LANDSAT Satellite (LANDSAT-1) as a data-relay platform, has been tested in south Florida. The purpose of DCS is to transmit water data to the user in near real time, even from remote areas. The flow of data is from data-collection platforms at field sites via LANDSAT-1 satellite to the National Aeronautics and Space Administration's (NASA) ground-receiving stations to the NASA Data Processing Facility at Goddard Space Flight Center to the Miami office of the U. S. Geological Survey to data users. The process requires only a few hours, and current data are provided to water-management agencies in several different forms. Thousands of square miles of south Florida are inundated many months of the year when the only practical access is by airboat or helicopter. The need for near-real-time data becomes imperative during times of crisis, such as a hurricane, because rapid evaluation of the situation and operational decisions are mandatory. In October 1972 a DCS began transmitting to the U. S. Geological Survey Office in Miami, water-level and rainfall information from gaging stations in the water-conservation areas, Everglades National Park, and Big Cypress Swamp. The time for this transmittal is about 45 minutes. (Woodward-USGS)
W76-01578

GENERAL MODEL TO SIMULATE FLOW IN BRANCHED ESTUARIES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W76-01580

A MODEL OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS FIR FOREST FLOOR,
Minnesota Univ., Minneapolis. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 2I.
W76-01613

LIQUID CHROMATOGRAPHIC ANALYSES IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W76-01636

PAPER CHROMATOGRAPHIC ANALYSIS IN AIR POLLUTION,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W76-01637

PAPER CHROMATOGRAPHIC ANALYSIS IN SOIL CHEMISTRY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5A.
W76-01638

DETECTION OF SOIL MOISTURE BY REMOTE SURVEILLANCE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-01706

STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY AND TEMPERATURES,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 2K.
W76-01716

A CLOSE-INTERVAL FRACTIONATOR FOR SEDIMENT CORES,
Union Carbide Corp., Tarrytown, N.Y. Environmental Science Program.
For primary bibliographic entry see Field 2J.
W76-01720

SOME ENVIRONMENTAL PROBLEMS AND THEIR SATELLITE MONITORING,
Tel Aviv Univ., (Israel). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W76-01791

WATER QUALITY STUDIES AND LAND-USE MAPPING USING ERTS-1 DATA,
Lund Univ. (Sweden). Dept. of Geography.
For primary bibliographic entry see Field 5A.
W76-01792

REMOTE SENSING OF COAL MINE POLLUTION IN THE UPPER POTOMAC RIVER BASIN.
Ambionics, Inc., Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-01831

WAVE HEIGHT INDICATOR LITERATURE SEARCH AND VENDOR SURVEY,
For primary bibliographic entry see Field 2L.
W76-01834

FEASIBILITY OF REMOTE SENSING FOR DETECTING THERMAL POLLUTION--PART I: FEASIBILITY STUDY; PART II: IMPLEMENTATION PLAN,
Miami Univ. Coral Gables, Fa. Dept. of Mechanical and Industrial Engineering.
For primary bibliographic entry see Field 5A.
W76-01838

REMOTE SENSING APPLICATIONS IN MARINE SCIENCE PROGRAMS AT VIMS,
Virginia Inst. of Marine Science, Gloucester Point.
H. H. Gordon, M. E. Penney, and R. J. Byrne.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-10566, $5.00 in paper copy, $2.25 in microfiche. Report NASA CR-137475, October 1974. 79 p, 29 fig, 5 tab, 25 ref, 2 append. NASA NAS6-1902.

Descriptors: *Remote sensing, *Wetlands, *Thermal pollution, *Virginia, Powerplants, Heated water, Satellites(Artifical), Aircraft, Salt marshes, Coasts, Seashores, Inlets(Waterways), Barrier islands, Tides, Measurement, Instrumentation, Data processing, Estuaries.

During 1973 scientists at the Virginia Institute of Marine Science (VIMS) utilized remote sensing in three programs: tonal variations in imagery of wetlands, use of the thermal infrared to delineate the discharge cooling water at the Virginia Electric and Power Company nuclear power station of the James River, and the use of aerial photography to determine the volume storage function for water in the marsh-bay complex fed by Wachapreague Inlet on the Eastern Shore of Virginia. One program was to determine the causes of tonal variations in wetlands imagery and delimit their scope. Results from a predominately single-species salt marsh show variations in tone large enough to cause confusion in an automatic mapping scheme or bioproductivity studies. Thermal infrared imagery from a scanner was used to obtain an instantaneous surface thermal map of the area. Rectification of the strip film from the scanner, thermal-spatial resolution, and the correlation of the geometrically corrected scanner output with ground recorded information is discussed. Some insights into the plume behavior are presented. (Sims-ISWS)
W76-01839

DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING THERMAL INFRARED IMAGERY,
Alabama Univ., Huntsville. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-01840

BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, Ann Arbor.
F. J. Thomson.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A001-090, $4.00 in paper copy, $2.25 in microfiche. Quarterly Report, October 15, 1974. 28 p, 11 fig, 3 ref. N00014-74-C-2073.

Descriptors: *Remote sensing, *Coasts, *Florida, Beaches, Seashores, Estuaries, Sands, Bottom sediments, Radar, Aircraft, *Mapping, Measurement, Instrumentation, On-site investigations, Strip mine wastes, Coal mines, Data collections, Data processing.

Work on this contract is divided into three tasks: (1) compositional mapping of beaches and river systems, (2) enhancement and location of bottom features with passive multispectral data, and (3) multispectral radar imaging for coastal areas. In Task I, an attempt is being made to build on the capability to discriminate silica sand beaches from other beaches through the use of the restrahlen technique. The specific focus is to obtain estimates of beach sand grain size, beach moisture content, and sorting of beach materials through the use of remote sensing indicators. These parameters are important in assessing trafficability. In Task II, the emphasis is on developing techniques for delineating bottom features, independent of water depth, using passive multispectral data. While the approaches used are similar to those for measuring water depth, further refinement of that proven capability is not a research task under this contract. In Task III, the potential utility of X and L Band synthetic radar as an all-weather beach sensor is being addressed. Because of the relatively less advanced state-of-the-art of interpretation and processing of radar data, this task has so far emphasized the digitization of radar imagery and the preparation of some promising ratio algorithms. (Sims-ISWS)
W76-01842

A FRAZIL ICE CONCENTRATION MEASURING SYSTEM USING A LASER DOPPLER VELOCIMETER,
Bendix Corp., Davenport, Iowa. Instruments and Life Support Div.
For primary bibliographic entry see Field 2C.
W76-01850

A NOTE ON THE MOISTURE DIFFUSIVITY OF SATURATED SWELLING SYSTEMS FROM DESORPTION EXPERIMENTS,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology and Climatology.
For primary bibliographic entry see Field 2G.
W76-01852

DESIGN AND USE OF CLOSED-TOP INFILTROMETERS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2G.
W76-01854

MEASURING SOIL CREEP,
Iowa State Univ., Ames. Dept. of Agronomy.
F. R. Troeh.
Soil Science Society of America Proceedings, Vol 39, No 4, p 707-709, July-August 1975. 4 fig, 2 tab, 5 ref.

Descriptors: *Creep, *Mass wasting, *Soils, *Slope stability, *Solifluction, *Measurement, Instrumentation, Soil density, Slopes, Strain gages, Sites, On-site tests.
Identifiers: *Soil movement, Augers.

Soil creep occurs so slowly that it is usually overlooked. Nevertheless, its persistence makes it significant to sciences that deal with soils or landscapes. Creeping soil can move landmarks and cause structures to tilt or collapse. But, the rate of movement by soil creep under various conditions is largely unknown. A sensor that measures soil creep was described. The sensor was a sheet metal structure buried in a deep auger hole. Movement detectors mounted at four depths on the sensor were coupled to indicators at the soil surface to show how much movement has occurred. Readings from such sensors identify the location, depth, and rate of soil creep. (Visocky-ISWS)
W76-01856

A COMPARISON OF CANADIAN AND UNITED STATES STANDARD METHODS OF MEASURING PRECIPITATION,
Windsor Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W76-01858

RADIATION EQUIPMENT AND THE PRIN PLES INVOLVED IN ITS USE,
Food and Agriculture Organization of the Un Nations, Rome (Italy). and International Ato Energy Agency, Vienna (Austria). Div. of Ato Energy in Food and Agriculture.
For primary bibliographic entry see Field 2G.
W76-01883

A SUCTION SAMPLER FOR QUANTITATI LY SAMPLING BENTHOS ON ROCKY S STRATES IN RIVERS,
Ichthyological Associates, Inc., Berwick, Pa.
W. F. Gale, and J. D. Thompson.
Transactions of the American Fisheries Soci No 2, p 398-405, 1975. 2 fig, 3 tab, 17 ref.

Descriptors: Technology, *Methodol *Design, *Sampling, Aquatic organisms, Effic cies, Benthos, Population.
Identifiers: *Suction sampler, Rocky substrate

A dome sampler was designed to be used b scuba diver to sample benthos quantitatively. E of the organisms released inside the sampler w recovered during efficiency tests. Ten min pumping per sample was required for best resu The sampler was described in detail. (Klein)
W76-01905

A SIMPLE DOSING SYSTEM FOR CONTI OUS STREAM DOSING,
Michigan Univ., Ann Arbor. Dept. of Envi mental Health.
P. J. Eisele.
Transactions of the American Fisheries Soci No 2, p 359-362, 1975. 2 fig, 2 ref.

Descriptors: Technology, *Methodol *Design, *Flow systems, Water quality, Toxic Laboratory tests, Organic compounds, Stre flow, Pesticides.
Identifiers: *Dosing system, *Continuous str dosing, Methoxychlor.

A simple mechanical dosing apparatus to cont ously dose streams with chemicals solutions volved a modified Sutro weir and a simple le float system. This dosing device was easily c structed, inexpensive, and quite reliable un conditions of minor flow variation (a seasc fluctuation of one order of magnitude or less maintained an average stream concentration va tion of only plus or minus 10 percent during a of low level pesticide dosing. (Klein)
W76-01908

A COMPARISON OF FOUR SAMPLERS F BENTHIC MACROINVERTEBRATES INHAE ING COARSE RIVER DEPOSITS,
University of Wales Inst. of Science Technology, Cardiff. Dept. of Applied Biology
B. D. Hughes.
Water Research, Vol 9, No 1, p 61-69, Janu 1975. 5 tab, 36 ref.

Descriptors: *Benthic fauna, *Invertebra *Sampling, Electric shocking gear, Nets, Ana cal techniques, Bottom sampling, On-site data lections, Benthos, Methodology, Biological c munities, Electrical equipment, Technology.
Identifiers: *Artificial substrate samples, *Surb sampler, *Box samplers, Wales.

Four methods of taking quantitative samples benthic invertebrates were compared at two s on a river in South Wales. Substantial differen were found in the qualitative and quantitat composition of the catches. Explanations for th differences are presented. Two of the samp had nets, one utilized electric shock and one w tray 'artificial' substrate. (Katz)
W76-01909

A SALINITY CONTROLLER FOR FLOW-THROUGH BIOASSAYS,
Environmental Protection Agency, Gulf Breeze, Fl. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W76-01929

7. Evaluation, Processing and Publication

IMPLEMENTATION OF A N. P. D. E. S. DATA MANAGEMENT SYSTEM,
Krannert School of Industrial Management. Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01502

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert School of Industrial Administration. Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W76-01508

A REVIEW OF STATISTICAL PROCEDURES USED FOR EXAMINATION OF WATER DATA,
Massachusetts Univ., Amherst. School of Health Sciences.
For primary bibliographic entry see Field 7A.
W76-01509

AN INFORMATION RETRIEVAL SYSTEM FOR THE MACROINVERTEBRATE FAUNA OF INDIANA RIVERS AND LAKES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2I.
W76-01513

THREE-DIMENSIONAL SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-01518

HYDROGEOLOGY OF GLACIAL DEPOSITS IN PARKE AND PECANOE COUNTY, INDIANA, SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING WATER RESOURCES IN MEDIUM SIZE COMMUNITIES,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W76-01521

READING USAC PROJECT: SEWER AND WATER ACCOUNTS PROCESSING COMPUTER PROGRAM, RELEASE NUMBER ONE, SOFTWARE,
Reading, Pa. USAC Project.
For primary bibliographic entry see Field 5G.
W76-01527

HYDROLOGIC UNIT MAP--1974, STATE OF WISCONSIN.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22902, Price $1.25.
Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Wisconsin, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Wic), *Hydrologic boundaries, Subregions, Accounting units, Catologing units.

This map and accompanying table show Hydrologic Units in Wisconsin that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information of Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodward-USGS)
W76-01571

HYDROLOGIC UNIT MAP--1974, STATE OF HAWAII.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.25.
Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Hawaii, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Hawaii), *Hydrologic boundaries, Subregions, Accounting units, Catologing units.

This map and accompanying table show Hydrologic Units in Hawaii that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodward-USGS)
W76-01572

HYDROLOGIC UNIT MAP--1974, STATE OF GEORGIA.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.00.
Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Georgia, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit map(Ga), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Georgia that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resource Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodward-USGS)
W76-01573

HYDROLOGIC UNIT MAP--1974, STATE OF ILLINOIS.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.00.
Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Illinois, Water resources, Data collections, Planning, hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologlic unit maps(Ill), *Hydrologic boundaries, Subregions, Accounting units, Catologing units.

This map and accompanying table show Hydrologic Units in Illinois that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodward-USGS)
W76-01574

SATELLITE RELAY AND PROCESSING OF HYDROLOGIC DATA IN SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7B.
W76-01578

LAKES OF OREGON: VOLUME 3. HOOD RIVER, MULTNOMAH, WASHINGTON, AND YAMHILL COUNTIES,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2H.
W76-01579

MAP SHOWING FLOOD OF APRIL 1975 AT MERIDIAN TOWNSHIP, MICHIGAN,
Geological Survey, Lansing, Mich.
R. L. Knutilla, and L. A. Swallow.
Open-file map, 1975. 2 sheets, 7 fig, 2 tab.

Descriptors: *Floods, *Maps, *Flood data, *Michigan, *Streamflow, Flow measurement, Discharge(Water), Flood damage, Aerial photography, Hydrographs, Flood peak, Peak discharge, Snowmelt, Rainfall, Flood frequency, Hydrologic data.
Identifiers: *Meridian Township(Mich), *Red Cedar River(Mich).

On April 18, 1975 between 5 p.m. and 12 p.m. Meridian Township, Michigan, experienced an intense rain storm that caused the Red Cedar River to overflow its banks resulting in extensive flooding. Damages may be as high as 6.25 million dollars. The drainage area of the Red Cedar River at the east boundary of the report area (Meridian Road) is about 315 square miles. At the west boundary (Hagadorn Road) the drainage area is about 355 square miles. Two weeks prior to the storm, about 13 inches of snow fell over most of the Red Cedar River basin. Subsequent melting caused increased streamflow. The extent of flooding along the Red Cedar River and Pine Lake Outlet is shown on the photomosaic base maps. Discharge data obtained at East Lansing are equivalent to those at the western boundary of Meridian Township. Discharge is about 10 percent lower at the eastern boundary. The discharge hydrograph for East Lansing shows the peak discharge of 5,940 cfs which occurred near midnight on April 20. This discharge is equivalent to a runoff of about 17 cfs per square mile of drainage area. The flood had a recurrence interval of about 40 years or about a 2.5 percent chance of occurrence in any year. (Woodard-USGS)
W76-01584

GEOLOGIC CONTROL OF SUPPLY AND QUALITY OF WATER IN THE MOUNTAINOUS PART OF JEFFERSON COUNTY, COLORADO,
Geological Survey, Denver, Colo.
W. E. Hofstra, and D. C. Hall.
Available from Colorado Geological Survey, Dept. of Natural Resources, Denver Colo., Price $3.00. Colorado Department of Natural Resources, Denver, Bulletin 36, 1975. 51 p, 42 fig, 8 tab, 54 ref.

Descriptors: *Basic data collections, *Hydrologic data, *Colorado, Surface waters, Groundwater, Water quality, Streamflow, Water wells, Aquifer characteristics.
Identifiers: *Jefferson County(Colo).

Information is presented on the availability of water for domestic supply in the mountainous area in Jefferson County, Colo. The area covered by the study is roughly 300 square miles of mountainous Jefferson County extending from Clear Creek on the north to the Pike National Forest boundary on the south and from the east edge of the Front Range mountains to the western boundary of the county. The population of the mountainous part of the county was roughly 20,000 in 1974. Hydrologic data were collected at 34 streamflow sites. Bacteriological and chemical analyses of surface waters are given for 32 sites. During the study, 31 springs and 727 wells were sampled. Comprehensive bacteriological and chemical analyses of samples collected from 38 wells and 1 spring are given. Eleven test wells drilled by air-percussion. Geologic logs and hydrologic test data for wells are given. (Woodard-USGS)
W76-01585

HISTORY OF IRRIGATION AND CHARACTERISTICS OF STREAMFLOW IN NORTHERN NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4A.
W76-01589

GROUND WATER IN SELECTED AREAS IN THE KLAMATH BASIN, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2F.
W76-01590

INVENTORY AND CATALOGING OF SPORT FISH AND SPORT FISH WATERS IN SOUTHEAST ALASKA,
Alaska Dept. of Fish and Game, Juneau.
A. Schmidt, and F. S. Robards.
Alaska Division of Sport Fish, Vol 16, Study G-I-A, July 1, 1974-June 30, 1975. 113 p, 31 fig, 49 tab. 59 ref.

Descriptors: *Census, *Fish populations, *Sport fish, *Alaska, *Lake fisheries, Chemical properties, Oligotrophy, Trout, Productivity, Benthic fauna, Diptera, Oligochaetes, Fish food organisms, Streams, Specific conductance, Fish stocking, Recreation, Salmon, Water temperature, Lake marphometry, Dissolved oxygen, Plankton, Zooplankton, Aquatic insects, Fish diets, Hydrogen ion concentration, Thermal stratification.
Identifiers: *Sitka(Alas), Dolly Varden char.

Limnological studies of eight southern Alaska lakes revealed limited fish production due to their oligotrophic character and lack of shoal areas. Conductivity, except in Redoubt Lake, was less than 50 micromhos. The rating of productivity, in descending order, was Swan, Blue, Osprey, Auke, De Boer, Spurt, Redoubt, and Green Lakes. Predominant bottom fauna were Chironomidae and Oligochaeta. As pH values are correlated with fish survival, many of the southeastern Alaska lakes with low temperature, soft water, and acid bog conditions are probably unsuited for rainbow trout production. Evaluation of sport fishing resources along the Sitka area road system were conducted by walking each stream and sampling with minnow traps; particular emphasis was placed upon spawning and rearing areas and any blocks to fish passage. The Sitka area saltwater creel census determined the contribution of returning coho salmon produced from the saltwater rearing pens at Starrigavan Bay. A shoreline saltwater creel census was conducted in the Auke Creek and in the Juneau area. The recreation potential of De Boer, Spurt and Swan lakes is described. Census estimates of king, coho, Pacific halibut, sockeye, pink, Dolly Varden, cutthroat, and chum taken in Auke Creek, and in the Juneau and Sitka areas are given. (Auen-Wisconsin)
W76-01623

BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W76-01842

SOIL-GEOMORPHIC RELATIONSHIPS IN A FIRST-ORDER VALLEY IN CENTRAL NEW YORK,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-01855

APPENDICES TO: SURVEY STUDY TO SELECT A LIMITED NUMBER OF HAZARDOUS MATERIALS TO DEFINE AMELIORATION REQUIREMENTS,
Little (Arthur D.) Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-01902

8. ENGINEERING WORKS

SEWER LAYING SYSTEM,
W. R. Brown.
United States Patent 3,906,737. Issued September 23, 1975. Official Gazette of the United States Patent Office, Vol 928, No 4, p 1529, September, 1975. 1 fig.

Descriptors: *Sewers, *Sewerage, *Patents, Equipment, Installation, Tiles, Tile drains.

A tile setting piece of machinery has been patented for the laying of sewers. The apparatus consists of: a chassis trestle including parallel base rails; a pair of top rails on pillars in alignment with and above the base rails; and transverse beams connecting the respective terminal ends of both the top and base rails. A tile-bed laying car is mounted between the top rails on trolleys. One of the trolleys moves the car along the top rail. The car has side walls and end walls which form an enclosure, open at the top and bottom, to collect and pass a predetermined layer of aggregate material. The car also has a tile setting bumper projecting to the rear of the car and a push ring to engage the bell flange of a tile. A cover fill car is mounted behind the bed laying car wihtin the trestle on the trolleys. The cover fill car is also moved along the top rails, and has side and end walls, so that a predetermined layer of cover material may be released over the installed tiles. (Kramer-FIRL)
W76-01533

8A. Structures

DESIGN OF IRRIGATION RUNOFF RECOVERY SYSTEMS,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.
W76-01702

BREAKWATERS FOR LONG, SHORT AND/O COMPLEX WATER WAVES,
K. P. H. Frey
U. S. Patent No 3,908,384. 4 p. 4 fig. 9 ref. Offic Gazette of the United States Patent Office, V 938, No 5, p 2068, September 30, 1975

Descriptors: *Patents, *Breakwaters, *Coas structures, *Waves(Water), Shore protection, A tenuation
Identifiers: Dampening

This invention relates to a breakwater, especia for use where a large range of wavesteepness (i ratio of wave height to wave length) is encou tered, such as in coastal regions of oceans a large lakes. This new breakwater is a compos device and comprises two different kinds of bre waters. The first breakwater section is adapted dampen relatively short waves and/or short co ponents of a long wave. After the wave has pass this first section it encounters the second secti which is adapted to dampen long waves. T second section can effectively do this because t first section acts as a primary wave cont method. Sufficient amounts of energy have be eliminated before the transmitted wave reach the second section. The first section comprises a series of vanes the first of which is substantia below water level. The subsequent vanes progressively higher until at least one is near to above water level, and then one or more furth vanes are positioned at one or more lower lev until the last one is again substantially below wa level. The second section is a single convex s face (viewed from above) having its leading ed parallel to water level and perpendicular to the coming waves. The curved surface may be f upper side of a plate of any suitable material. curves slowly upward to its trailing edge which above water level. (Sinha-OEIS)
W76-01723

EFFECT OF VALLEY SHAPE ON RETENTI BASIN PERFORMANCE,
For primary bibliographic entry see Field 4A.
W76-01773

PREVENTION OF FRAZIL ICE CLOGGING WATER INTAKES BY APPLICATION HEAT,
Bureau of Reclamation, Denver, Colo. Engine ing and Research Center.
T. H. Logan.
Available from the National Technical Inform tion Service, Springfield, Va 22161, as PB-236 $4.00 in paper copy, $2.25 in microfiche. Rep REC-ERC-75-15, September 1974. 22 p, 6 fig tab, 68 ref, append.

Descriptors: *Intakes structures, *Frazil i *Heating, Ice, Canals, Intakes, Ice cover, Melti Slush, Trash racks, Barriers, Open channels.
Identifiers: Trashrack bars.

The phenomenon of ice formation in flowing wa and the technology of heating trashrack bars prevent clogging by frazil ice were reviewed. T report included: (1) a description of frazil ice f mation, (2) development of heat transfer equatic for trashrack bars immersed in a fluid, (3) corre tion between conditions assumed in developing t theoretical expressions and actual conditic present in a water intake, (4) economics of heat trashrack bars, (5) methods of heating trashra bars, and (6) recommendations for future studi (Sims-ISWS)
W76-01832

8B. Hydraulics

USE OF DRAINAGE WELLS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-01566

KLE IRRIGATION LATERAL DESIGN,
A and M Univ., College Station. Dept. of ultural Engineering.
rimary bibliographic entry see Field 3F.
701568

PRESSURE JET CLEANING OF PLASTIC INS IN SANDY SOIL,
ultural Research and Education Center, Alfred, Fla.
. Ford.
actions of the ASAE (American Society of ultural Engineers), Vol 17, No 5, p 895-897, mber-October, 1974. 3 fig, 1 tab, 6 ref.

riptors: *Jets, *Drainage practices, surface drains, Cleaning, Drains, Drainage ms, Sludge, *Florida, Agriculture, Plastic , Sands.
ifiers: *Plastic drainage pipe, Gravel en- e, Jet cleaning, Corrugated pipes.

w pressure jetting method is described for ving sludges from plastic drains and from the unding thin gravel envelope utilized in da sandy soils. There was no sand infiltration gravel envelopes 0.75 to 1.50 in thick with gated plastic polyethylene pipe employed in installations. A low pressure jet cleaning m can function in 5-to 5-in. plastic drains up 0 ft. in length where ochre and FeS are the ary deposits to be removed. Cleaning of the l envelope can be accomplished presumably e surging action of jetting pressure. Jetting ld be performed at a slow entry rate and with draulic head above the drain. In sandy areas e sludges are a problem, jetting should be per- ed within 2 weeks after initial drain flow. gerboe-Colorado State)
-01569

ECTION OF ECONOMICAL PIPE SIZES WATER DISTRIBUTION NETWORKS,
ied Cybernetics, Merritt Island, Fla.
rimary bibliographic entry see Field 5F.
-01787

DDY DIAGRAM FOR DIRECT PIPE METER CALCULATION,
onsin Univ., Milwaukee. Dept. of Energetics.
S. Lai, and K. K. Lee.
nal of the Hydraulics Division, Proceedings of E, Vol 101, No HY10, p 1377-1380, October, . 1 fig, 9 ref.

riptors: *Equations, *Pipes, *Mathematical els, Flow, Design, *Moody resistance dia- s, Pipe flow, Darcy-Weisbach equation.

rmining the best pipe diameter size for rough mercial pipes is a necessary step in design for flow applications. The modified Moody dia- and its associated pipe diameter formula are trated as a direct time-saving method for find- the desired pipe size. A continuity equation the Darcy-Weisbach equation are derived, and ody diagram with an auxiliary scale Reynolds ber versus the friction factor for various rela- roughness has been plotted. An alternative dy diagram for finding the diameter directly is trated, where a suitable scale can be found out explicitly depending upon pipe diameter in roughness of the pipe/pipe diameter scale. mer-FIRL)
-01793

LUATING THE IMPACT OF STRUC- ALLY INTERRUPTED FLOOD PLAIN WS,
nell Univ., Ithaca, N.Y. Dept. of Structural ineering.
primary bibliographic entry see Field 4A.
-01808

HYDRAULIC MODEL STUDIES OF THE TETON CANAL OUTLET WORKS ENERGY DISSIPATOR,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
T. J. Isbester.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 610, $4.00 in paper copy, $2.25 in microfiche. Report No REC-ERC-74-16, October 1974. 23 p, 16 fig, 8 ref.

Descriptors: *Model studies, *Energy dissipation, *Head loss, *Cavitation, *Idaho, Scaling, Hydraulic models, Canals, Outlet works, Discharge(Water), Flow, Gates.
Identifiers: *Teton(Dam).

Studies were made on a 1:5.66 scale model of a single jet-flow gate and sudden expansion energy dissipator to determine discharge coefficients for full and partial gate openings, head losses through the facility, cavitation characteristics, and the back-pressure requirements for the submerged jet-flow gate. The two-diameter expansion was inadequate and was replaced by a three-diameter section. A method of cavitation scaling was discussed whereby visible and/or aurally detectable model incipient cavitation was used to determine incipient cavitation lines for a series of single gate openings and a range of discharges from no-flow through that obtained at maximum head. Using the slope of the model line and the scale vapor pressure, the prototype incipient cavitation line was obtained. A white-pigmented concrete curing compound was found to be satisfactory for use as a cavitation indicator. (Bhownik-ISWS)
W76-01833

HYDRAULIC CONSTANTS OF TIDAL ENTRANCES, II: STABILITY OF LONG ISLAND INLETS,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W76-01836

TURBULENT JETS WITH REVERSIBLE BUOYANCY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-01849

8C. Hydraulic Machinery

HIGH-PRESSURE WATER JET CLEANING OF SUBSURFACE DRAINS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. B. Grass, and L. S. Willardson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 5, p 886-888 and 891, September-October 1974. 7 fig, 8 ref.

Descriptors: *Jets, *Drainage practices, *Hydraulic equipment, *Hydraulic machinery, Cleaning, Tile drains, High pressure, Drains, Drainage systems, Hydraulics, Subsurface drains, Agriculture.
Identifiers: *Jet cleaning.

High-pressure jetting equipment utilized the macerating action of high- velocity water jets and vigorous water turbulence to clean roots, silt, and chemical deposits from subsurface drains. Water existing from the rear jets propels the nozzle and hose up the drain. Two types of nozzles are most commonly used in Imperial Valley: (a) the cleaning nozzle used mainly for removing silt and mineral deposits requiring a pump pressure of 1250 psi and a nozzle pressure of 600 psi; and (b) the penetrator nozzle, used mainly for removing root plugs and the larger, more difficult accumulations of silt requiring pump pressure of 1000 psi and a nozzle pressure of 500 psi. A dewatering pump is used to remove the dislodged material arriving at the tile opening. The jet cleaning operation also can locate breaks in subsurface drain lines so that they can be repaired. (Skogerboe-Colorado State)
W76-01564

DREDGING COSTS: THEIR ESTIMATION AND IMPLICATIONS TO THE MANAGEMENT OF DREDGING OPERATIONS,
University of Wales Inst. of Science and Tech., Cardiff. Dept. of Maritime Science.
For primary bibliographic entry see Field 6C.
W76-01602

INDUSTRIAL WASTEWATER PUMPS,
Fluor Engineers and Constructors, Inc., Houston, Tex. Process Dept.
J. A. Scher.
Chemical Engineering, Deskbook Issue, p 95-101, October 6, 1975. 6 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pumps, Pumping, Equipment, Centrifugal pumps, Pump turbines, Hydraulic equipment, Hydraulic systems, Pistons, Water conveyance, Sumps, Hydraulic machiner.

An overview is given of the various types of pumps employed in the treatment of industrial effluents. The types of pumps include: centrifugal pumps; sump pumps; submersible pumps; positive-displacement piston pumps; diaphragm pumps; rotary pumps; and, peristaltic pumps. If the waste water to be pumped is not corrosive, then the pumps may be made of carbon steel, cast iron or other mild construction materials. However, if the waste water contains corrosive materials, then the construction materials must be resistant to chemicals. A table is presented which lists various construction materials and their resistance to some of the liquids commonly present as components of industrial wastes. Vertical sump pumps are ideal for use in open or closed collecting sumps, and can be controlled by float-type level controllers. Since additions for the chemical treatment of waters are usually made in terms of gal/hr, diaphragm pumps are very satisfactory. Piston pumps are used when larger capacities or higher discharge pressures are required. The pulsation of flows caused by the movement of the piston can be smoothed out by using two or three heads on the same pump. The solids content of slurries and sludges can range from 0.5% to 15% up to 75%. In general, if a slurry or sludge can be moved into the pumping elements, then it can also be moved out. Rotary pumps are the best pumps for slurry/sludge transport. They are self-priming, normally nonfouling, and provide a uniform flow. The choice of a pump for sampling has to be made individually for each particular situation. (Orr-FIRL)
W76-01661

CIVIL ENGINEERING FEATURES OF GEOTHERMAL POWER PLANT,
Pacific Gas and Electric Co., San Francisco, Calif.
S. Peters.
Journal of the Power Division, American Society of Civil Engineers, Vol 100, No PO2, p 157-173, December 1974. 11 fig, 2 tab, 23 ref.

Descriptors: *Geothermal studies, *Thermal powerplants, *Steam, *Thermal water, *Cooling water, *Wells, Construction costs, Thermal water, Geology, Geophysics, Heat flow, Powerplants, Thermal power, Piping systems(Mechanical), Electric power production, Engineering structures, Waste water disposal, Injection wells, Cooling towers, Seismic properties.
Identifiers: Civil engineering features, Pacific Gas and Electric Company(Cal), Site selection, Steam productivity, Geothermal plants.

A description is presented of the civil engineering features, the geology, seismicity, and the reservoir mechanism of the Geysers geothermal power project developed by the Pacific Gas and Electric Company, San Francisco, California. Site selection, construction materials, and plant design are also discussed. Steam productivity of the well is expected to decline with time, and new wells are drilled to maintain the steady supply of steam for the plant. By drilling wells at one per 40 acres, the production rate is better maintained. Geothermal plants, which do not require a supplemental source of cooling water, produce about 20 percent more condensate than is evaporated. This surplus is reinjected into unproductive wells which not only present the most efficient method of wastewater disposal, but also might prolong the life of the well field. Construction cost of geothermal capacity is about $150 per kilowatt, compared to $400 per kilowatt for fossil fuel plants and $600 per kilowatt for nuclear units. (Robinett-Arizona)
W76-01701

STAGE 1 DEVELOPMENT OF THE SHOALHAVEN SCHEME-I.
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 6B.
W76-01732

HYDRAULIC MODEL STUDIES OF THE TETON CANAL OUTLET WORKS ENERGY DISSIPATOR,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W76-01833

8D. Soil Mechanics

RESPONSE OF SATURATED SANDS TO CYCLIC SHEAR AT EARTHQUAKE AMPLITUDES,
Kentucky Water Resources Research Inst., Lexington.
V. P. Drnevich, and J. P. Jent.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 551, $4.00 in paper copy, $2.25 in microfiche. Research Report No 87, October 1975. 35 p, 12 fig, 4 tab, 11 ref. OWRT A-044-KY(1). 14-31-0001-3817, 14-31-0001-4017.

Descriptors: *Earthquake engineering, *Failure, *Modulus, *Sands, Sand aquifers, Seismic design, *Seismic properties, Shear strength, Soil dynamics, Soil mechanics, *Soil properties, Soil strength, *Soil testing, Stress analysis.
Identifiers: Damping, Liquefaction, Shear modulus, Simple shear, Undrained cyclic shear.

Both quasi-static and resonant cyclic shear tests were performed on hallow cylindrical specimens of saturated sands at various densities and confining stresses. Shear moduli measured at nondestructive amplitudes were shown to be independent of frequency for the range of 0.1 Hz to 50 hz. Application of cyclic shear at larger amplitudes caused effective stresses to decrease and failure. The number of cyles to failure was related to ratio of cyclic shear stress to maximum drained shear stress. Effective confining stress reduces approximately linearly with number of cycles. Shear modulus and shear damping can be described by the Hardin-Drnevich equations if change in effective stress is properly adjusted. Procedures were developed to use research results in analyzing soil in dam or other profiles to predict factor of safety against liquifaction failure and to estimate shear modulus and damping of soils for subliquefaction conditioning when these soils are subjected to earthquakes. (Huffsey-Kentucky)
W76-01814

MEASURING SOIL CREEP,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 7B.
W76-01856

8E. Rock Mechanics and Geology

OPTIMUM DESIGN OF DUG-WELLS IN HARD ROCK TERRAINS,
Osmania Univ., Hyderabad (India). Dept. of Geology.
Y. Janardan Rao, B. E. Vijayam, C. Sudarsana Raju, and M. Papi Reddy.
Indian Farming, Vol 25, No 3, p 8-12, June 1975. 3 fig.

Descriptors: *Water wells, *Dug wells, *Shallow wells, *Granites, *Water supply, Water sources, Groundwater, Groundwater mining, Water table, Well data, Water yield, Permeability, Wells, Sedimentary rocks, Hydrogeology, Boreholes, Joints(Geologic), Fracture permeability, Fractures(Geologic).
Identifiers: *Well design, Dykes, Indian, Hyderabad(India).

A description is presented of the problem of optimum design for dug-wells in hard rock areas, taking into account various factors relating to discharge, diameter, depth and storage capacity. The study areas in India fall into 3 distinct geological groups: (1) the granitic areas of Hyderabad, Nalgonda, Krishna, Guntur and Prakasam districts of Andhra Pradesh; (2) the sedimentary areas of Rayalaseema and adjoining parts of Telangana region; and (3) the Deccantrap area of Hyderabad district. For granitic rocks the open wells should be dug up to the bottom of the weathered zone, which is about 10 to 15 meters in Hyderabad region. Dug wells should be rectangular, with the longer side perpendicular to the strike of the shear zone or joint pattern. Since dykes act as barriers for groundwater flow, wells should be located on the upstream side of the strata. Wells located in pink granitic terrain have better chances of greater yield than do wells in the gray granite area. It is not advisable to deepen a dug-well beyond the weathered zone, but bores can be used on the side where fissures or fractures are present. (Robinett-Arizona)
W76-01892

8F. Concrete

PRECAST CONCRETE PILES CUT PLANT CONSTRUCTION COST,
Onondaga County Dept. of Drainage and Sanitation, N.Y.
J. J. Hennigan.
Public Works, Vol 106, No. 10, p 84-85, October, 1975. 1 fig.

Descriptors: *Construction materials, *Construction costs, *Treatment facilities, Costs, Environmental effects, Concrete technology, Waste water treatment, Industrial wastes, Sewer systems, New York.
Identifiers: Onondaga Lake(NY).

While the decision to provide secondary treatment of municipal and industrial waste water at the Metropolitan Syracuse Treatment Plant was made in 1965, several problems have delayed construction of the 83-mgd plant for over ten years. Preliminary studies were required, including an in-depth study of Onondaga Lake, a survey of the waste discharges of 140 industries which discharge to the sewer system, and associated investigations of joint municipal-industrial waste treatment feasibilities. The 1972 Amendments to the Water Pollution Control Act necessitated the adherence to new requirements, including infiltration/inflow studies, environmental impact and assessment statements, and public hearings. The final prob was the cost of steel product. In particular required 1,125,000 linear feet of piping. Du steel shortages and excessive prices in the sum of 1974, precast concrete piles were considere an alternative. These prestressed concrete p were eventually chosen, after the testing splice capable of taking tension. The price of struction, using the prestressed concrete p rather than those of steel, was $86.7 million, a $22 million less than the original engineering mate. (Kramer-FIRL)
W76-01560

8G. Materials

DEVELOPMENT OF ASPHALT CUSHION PLASTIC REINFORCED ASPHALT MEBRANES FOR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tson.
For primary bibliographic entry see Field 3B.
W76-01812

RESPONSE OF SATURATED SANDS CYCLIC SHEAR AT EARTHQUAKE APLITUDES,
Kentucky Water Resources Research Inst., Lington.
For primary bibliographic entry see Field 8D.
W76-01814

8I. Fisheries Engineering

TOXICITY OF ROTENONE TO SOME SPEC OF COARSE FISH AND INVERTEBRATES,
Ministry of Agriculture, Nairobi (Kenya). Wa Dept.
For primary bibliographic entry see Field 5C.
W76-01534

AN EXPERIMENT OF FASTER GROWTH SALMON SALMO SALAR (L.) IN A SCOTTI STREAM,
Freshwater Fisheries Lab., Pitlochry (Scotland).
H. J. Egglishaw, and P. E. Shackley.
J Fish Biol. Vol 5, No 2, p 197-204. 1973.

Descriptors: *Salmon, *Trout, Fish populations

The experiment was made in an attempt to mod the usual relationship in which young trout gr faster than young salmon in streams in which t occur together. A stretch of a trout stream w stocked with advanced salmon eggs, wh produced fry earlier than the trout eggs laid na rally. The salmon grew faster than the trout were longer than the trout at the end of the gr ing season. The mean length of 77.7 mm attai by the salmon is the largest known size reached salmon in their 1st yr when feeding on natural f supplies in streams in Scotland. Survival rate fr egg planting to production of salmon of this m length was high.--Copyright 1973, Biological stracts, Inc.
W76-01537

TESTS OF ESTIMATES OF PREFERR SPAWNING AND REARING DISCHARGES F TROUT IN SELECTED STREAMS IN WASH TON,
Geological Survey, Tacoma, Wash.
C. H. Swift, III.
Administrative Report, 1975. 83 p, 40 fig, 3 ref.

Descriptors: *Fish management, *Spawni *Trout, *Washington, Streams, Methodolo Equations, Streamflow, Discharge(Wat Regression analysis, Evaluation.
Identifiers: *Steelhead trout(Wash).

mates of spawning and rearing discharges for lhead trout were tested in three streams in tern Washington and for six species of resident t in three streams in northeastern Washington. estimates were obtained from a set of multi- regression equations that were previously eloped on a study of 54 reaches on 18 streams estern Washington. The equations for calcu- g spawning and rearing discharges for steel- were tentatively verified for western hington streams by the finding that two-thirds ore of the determined discharges were within standard error of estimate of the discharges nated from the regression equations for nine y reaches on the Samish River, Cloquallum ek, and Middle Fork Satsop River. However, equations for steelhead are not generally ap- able for estimating spawning and rearing harges for resident trout in northeastern hington, as indicated by the finding that most he discharge determined at nine study reaches Mill Creek, Deep Creek, and Chewelah Creek e not within one standard error of estimate of harges estimated from the equations. odward-USGS)
5-01575

ECTS OF A PARASITIC GUT NEMATODE CONSUMPTION AND GROWTH IN JU- NILE RAINBOW TROUT (SALMO GAIRD- RI),
fornia State Dept. of Fish and Game, Sacra- to. Regional II.
Hiscox, and R. W. Brocksen.
sh Res Board Can. Vol 30, No 3, p 443-450, . Illus.

criptors: *Trout, Nematodes, *Fish parasites. tifiers: Bulbodacnitis Ampullastoma, omis Cyanellus.

echnique was developed for differentially in- ing juvenile rainbow trout, S. gairdneri, by in- uction of the parasitic gut nematode, Bul- acnitis ampullastoma. Desired infection levels e induced in trout with 80% success. B. ampul- oma affected growth and food consumption of t in the laboratory. The effects of the parasite e evident at low and high ration levels. At low starvation ration levels the parasite effected a drawal of the energy stores of the fish. At er ration levels, the direct effects of the site were compounded by apparent parasite rference with food assimilation by the fish. B. ullastoma was directly infective to a warm- er fish, Lepomis cyanellus.--Copyright (c) , Biological Abstracts, Inc.
5-01622

ENTORY AND CATALOGING OF SPORT H AND SPORT FISH WATERS IN UTHEAST ALASKA,
ska Dept. of Fish and Game, Juneau.
primary bibliographic entry see Field 7C.
5-01623

UCTURE OF THE PLANKTON COMMUNI- OF FISH-REARING PONDS OF THE UTHERN URALS, (IN RUSSIAN),
l and Siberian Fishery Scientific-Research and ning Inst., Sverdlovsk (USSR).
G. Andreyashkin, T. S. Lyubimova, and M. I. ushina.
logiya. 5(4): 53-60. Illus. 1974.

criptors: *Plankton, *Mathematical studies, alyses, *Carp, Fish, *Fish populations, Algae, plankton, Ponds, Fish hatcheries. tifiers: pH, Ponds, Urals, USSR.

results of a mathematical analysis of the kton community in carp rearing ponds mass and hydrochemical characteristics) are ented. The populations are joined in groups re- d by favorable intragroup influences. Dominance of a particular group of algae depends mainly on the pH of the water, and dominance of the zooplankton groups depends on the composition and state of the algal mass.--Copyright (c) 1975, Biological Abstracts, Inc.
W76-01700

RELATIONSHIP OF DISCHARGE REDUCTIONS TO AVAILABLE TROUT HABITAT FOR RECOMMENDING SUITABLE STREAMFLOWS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 4A.
W76-01809

DETERMINATION OF THE NUMBER OF COMMERCIAL AND NONCOMMERCIAL RECREATIONAL BOATS IN THE UNITED STATES, THEIR USE, AND SELECTED CHARACTERISTICS,
For primary bibliographic entry see Field 6B.
W76-01817

EFFECTS OF QUALITY AND QUANTITY OF FOOD ON GOLDEN SHINER, NOTEMIGONUS CRYSOLEUCAS, PRODUCTION,
Arkansas Univ., Fayetteville. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W76-01900

ENTRAPMENT OF FISHES ON INTAKE WATER SCREENS AT A STEAM ELECTRIC GENERATING STATION,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
B. Grimes.
Chesapeake Science, Vol 16, No 3, p 172-177, September 1975. 3 fig, 2 tab, 11 ref.

Descriptors: *Sampling, Fish migration, Fish, Mortalities, Temperature, Water quality, Thermal powerplants, Diurnal, Water pollution effects.
Identifiers: *Fish entrapment.

To investigate entrapment of fishes, travelling intake water screens were sampled monthly in 1969 and 1970 at a steam electric power station near Crystal River, Florida. Samples contained 73 species representing 41 families; the majority of individuals were juveniles of weak-swimming species. There was an inverse relationship between intake water temperature and catch. Highest mortalities occurred with the first cold temperatures of winter and later with lowest water temperatures. Comparison of catch-per-unit-effort during daylight and darkness in 1970 showed monthly catch-per-hour for dark sampling approximately equal to or greater than for light. Greatest disparities between day and night sampling occurred simultaneously with coldest water temperatures. (Klein)
W76-01939

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

AN INFORMATION RETRIEVAL SYSTEM FOR THE MACROINVERTEBRATE FAUNA OF INDIANA RIVERS AND LAKES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02I.
W76-01513

10C. Secondary Publication And Distribution

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SIXTH VOLUME.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 06A.
W76-01517

BIBLIOGRAPHY ON NUTRITIONAL REQUIREMENTS OF WARM WATER FISHES (BIBLIOGRAPHIE SUR LES BESOINS NUTRITIFS DES POISSONS VIVANT EN EAUX CHAUDES),
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station; and Ministry of Agriculture, Dor (Israel). Dept. of Fisheries.
For primary bibliographic entry see Field 02I.
W76-01915

10D. Specialized Information Center Services

IMPLEMENTATION OF A N. P. D. E. S. DATA MANAGEMENT SYSTEM,
Krannert School of Industrial Management. Lafayette, Ind.
For primary bibliographic entry see Field 05G.
W76-01502

10F. Preparation Of Reviews

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON MANGANESE.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Research and Development.
For primary bibliographic entry see Field 05A.
W76-01863

Mary Baldwin College
Staunton, Virginia

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 5
MARCH 1, 1976

W76-02001 -- W76-02500

ry of the U.S. Department of the Interior has de-
t the publication of this periodical is necessary in the
f the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

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FOREWORD

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C IS NOT PRESENTLY IN A POSITION TO PROVIDE ES OF DOCUMENTS ABSTRACTED IN THIS JOUR- Sufficient bibliographic information is given to enable rs to order the desired documents from local libraries er sources.

ted Water Resources Abstracts is designed to serve ientific and technical information needs of scientists, eers, and managers as one of several planned services Water Resources Scientific Information Center IC). The Center was established by the Secretary of the r and has been designated by the Federal Council for ce and Technology to serve the water resources com- y by improving the communication of water-related rch results. The Center is pursuing this objective by co- ting and supplementing the existing scientific and tech- nformation activities associated with active research vestigation program in water resources.

ovide WRSIC with input, selected organizations with water resources research programs are supported as ers of competence" responsible for selecting, abstract- ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
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10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

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Aqueous Solutions and spensions

TIONS OF AQUEOUS ALUMINUM SPE-AT MINERAL SURFACES,
gical Survey, Menlo Park, Calif.
imary bibliographic entry see Field 2K.
2485

/ATER CYCLE

General

FALL-RUNOFF AS SPATIAL HASTIC PROCESSES: DATA COLLEC- AND SYNTHESIS,
chusetts Inst. of Tech., Cambridge. Ralph arsons Lab. for Water Resources and dynamics.
imary bibliographic entry see Field 2B.
2069

R RESOURCES INFORMATION NEEDS THE NORTHWEST FLORIDA WATER AGEMENT DISTRICT.
gical Survey, Tallahassee, Fla.
imary bibliographic entry see Field 4A.
2138

OR ANALYSIS FOR INTERPRETATION SIN PHYSIOGRAPHY,
Service, Berkley, Calif. Pacific Southwest and Range Experiment Station.
Rice.
oc. Int. Hydrol. Symp., Wellington, N.Z., 53-268, Illus.

ptors: *Geomorphology, *Peak discharge, onstration watersheds, *Chaparral, Regres- nalysis, Mountains, Analytical techniques, watersheds, Rainfall-runoff relationships, watersheds.
iers: *Factor analysis, *San Dimas Experi- Forest, Varimax.

analysis was used to screen variables ing the physiography of experimental on the San Dimas Experimental Forest in m California. The purpose of the screening identify variables which would be useful in rediction. Factor analyses were made utiliz- m 7 to 12 variables and rotating from 6 to 9 al components. The results tended to sup- e hypothesis that varimax rotation produces which are stable in spite of changes in the ariables. Factor analysis had heuristic utili- at it led to hypotheses concerning the inter- ucture of the basin's physiography. But it lead to the selection of a set of variables any great utility in the prediction of flood A multiple regression equation was ed to predict peak discharges. It was based hydrographs resulting from 35 storms on 14 The equation was verified by comparing ed and predicted peak discharges in two not used in its development. One of these was physiographically quite similar to the 14 basins and the other was quite dis- Contrary to expectation, the peak predic- s more accurate in the dissimilar basin than imilar one. (Forest Service-USDA)
2285

CHASTIC ELECTRICAL MODEL OF AN TE CLOUD: CHARGE GENERATION RECIPITATION DEVELOPMENT,
iv Univ. (Israel). Dept. of Environmental es.

For primary bibliographic entry see Field 2B.
W76-02404

TOPOLOGICALLY RANDOM CHANNEL NETWORKS IN THE PRESENCE OF ENVIRONMENTAL CONTROLS,
New South Wales Univ., Kensington (Australia). School of Geography.
For primary bibliographic entry see Field 8B.
W76-02408

PREFERRED POSITION MODEL AND SUBSURFACE SYMMETRY OF VALLEYS,
Iowa State Univ., Ames. Dept. of Earth Sciences.
R. C. Palmquist.
Geological Society of America Bulletin, Vol 86, No 10, p 1392-1398, October 1975. 7 fig, 4 tab, 21 ref.

Descriptors: *Streams, *Alluvium, *Bedrock, *Cross-sections, *Sediments, *Valleys, Subsurface mapping, Meanders, Erosion, Frequency analysis, Scour, Model studies.
Identifiers: *Bedrock valleys, *Preferred position model, Underfit streams, Stream geometry, Symmetry indices.

In the preferred position model, the most common location of a stream within its valley is related to the transverse profile of the bedrock surface below the alluvium. The model postulates that if a stream scours bedrock at least occasionally, the amount of bedrock erosion will be proportioned to the duration of occupation by the stream of any particular portion of the valley floor. The transverse subsurface profile of the bedrock floor of the valley will be asymmetric if the stream tends to remain against one valley wall. Data on distribution of streams in their valleys indicate that streams preferentially occupy the outer half of their valleys at a bend but have no preferred position within straight reaches. The symmetry variations in the transverse profiles of bedrock valleys reflect these position variations. Borehole data suggest that, on the average, maximum scour depth occurs to a depth twice the bank height. Some streams that flow on alluvium and appear underfit may, in fact, be fit and some aspects of the underfit stream model are in need of re-evaluation. (Singh-ISWS)
W76-02410

GENERATION OF HOURLY RAINFALL,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-02416

USE OF AREAL SNOW COVER MEASUREMENTS TO DEVELOP SNOWMELT-RUNOFF RELATIONSHIPS FOR ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W76-02453

2B. Precipitation

A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 7C.
W76-02059

RAINFALL-RUNOFF AS SPATIAL STOCHASTIC PROCESSES: DATA COLLECTION AND SYNTHESIS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
R. L. Bras, and I. Rodriguez-Iturbe.
Report No 196; January 1975. 382 p, 37 fig, tab, ref. OWRT C-4118(9021). No 4-36738.

Descriptors: *Rainfall-Runoff relationships, *Rainfall, *Precipitation(Atmospheric), *Runoff, *Rain, *Climatology, *Stochastic processes, *Storm runoff, Storms, Forecasting, Flow, Weather forecasting, Flood forecasting, Rainfall intensity, Subsurface runoff.
Identifiers: *Rainfall-runoff models, Rainfall generators, Storm interior, Kinematic waves, Kinematics, Surface water runoff, Rainfall predictions, Runoff predictions.

This work recognize rainfall and runoff as multidimensional stochastic processes. Using the knowledge of such processes, a procedure for designing an optimal network to measure the total precipitation of an event over a fixed area is given. The methodology used in this static problem allows consideration of the following aspects of network design: (1) spatial correlation of process, (2) errors of measurement techniques and their correlation, and (3) non-homogeneous sampling costs. Optimal networks are given in terms of the number and location of stations together with the resulting costs and mean square error of estimation. The relation between rainfall and runoff is recognized as a dynamic problem. A statistically non-stationary, multi-dimensional rainfall generator is suggested. The model, capable of simulating historical storm exteriors, assumes the validity of Taylor's hypothesis of turbulence within a storm interior. The suggested rainfall model is used together with a runoff model to study the accuracy of discharge prediction as a function of the rainfall sampling network. The runoff model used is a spatially distributed simulation based on a finite difference solution of the Kinematic wave equations. (NOAA)
W76-02069

CHEMICAL COMPOSITION OF RAINFALL AT SELECTED SITES IN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 2K.
W76-02135

A STOCHASTIC ELECTRICAL MODEL OF AN INFINITE CLOUD: CHARGE GENERATION AND PRECIPITATION DEVELOPMENT,
Tel-Aviv Univ. (Israel). Dept. of Environmental Sciences.
W. D. Scott, and Z. Levin.
Journal of the Atmospheric Sciences, Vol 32, No 9, p 1814-1828, September 1975, 11 fig, 1 tab, 32 ref. AERO DA-ERO-124-74-G0058.

Descriptors: *Model studies, *Cloud physics, *Electric fields, *Precipitation(Atmospheric), Mathematical models, Stochastic processes, Clouds, Thunderstorms, Rainfall, Coalescences, Computer models, Drops(Fluids), Electrical studies, Electrical properties, Meteorology.
Identifiers: *Electrical charge generation.

A stochastic numerical cloud model was used to investigate simultaneously the growth of precipitation, the formation of electrical charges on the particles, and the development of the ambient electric field utilizing the polarization charging mechanism. The results indicated a close coupling between precipitation growth and electrification. Precipitation was reduced when the electric field reached magnitudes of kilovolts per centimeter. The distributions of charge on the particles showed charges of a realistic magnitude. It was concluded that the electrical repulsion of particles with charges of like sign directly decreases rain formation but indirectly results in additional partial coalescence events, a greater field growth, and early particle suspension. The electrical attraction of particles with charges of opposite sign can cause greatly enhanced precipitation formation

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without significant field development. (Sims-ISWS)
W76-02404

GENERATION OF HOURLY RAINFALL,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
N. Egbuniwe.
Water Resources Bulletin, Vol 11, No 4, p 706-713, August 1975, 3 fig, 2 tab, 8 ref.

Descriptors: *Simulated rainfall, *Stochastic processes, Rainfall, Model studies, Linear programming, Storms, Storm runoff, Flow duration, Historic floods, Rainfall-runoff relationships, Hydrology, Synthetic hydrology.
Identifiers: *Hourly rainfall, *Rainfall model, *Nigeria, Stanford Watershed Model, Linear regression, Storm duration, Historical rainfall.

A rainfall model was developed to divide daily rainfall into storms and distribute storm depths over storm duration for input into the Stanford Watershed Model. Rainfall data were collected in Nigeria by the Nigerian Meteorological Services. Most of the stations were located at airports where weather observations were considered more important than watershed studies. However, there were many stations where daily rainfall was measured, and a few that recorded hourly amounts. The study developed a rainfall model that could generate from daily totals for input into the Stanford Model. Five years of historical hourly rainfall data were processed for Yelwa, Nigeria. The model was found to be adequate when the output from the watershed model did not differ substantially from historical rainfall data. (Roberts-ISWS)
W76-02416

A NUMERICAL EXPERIMENT ON THE EFFECTS OF REGIONAL ATMOSPHERIC POLLUTION ON GLOBAL CLIMATE,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 5A.
W76-02420

APPROXIMATION FORMULAS FOR THE EQUILIBRIUM SIZE OF AN AERSOL PARTICLE AS A FUNCTION OF ITS DRY SIZE AND COMPOSITION AND THE AMBIENT RELATIVE HUMIDITY,
Naval Research Lab., Washington, D.C.
J. W. Fitzgerald.
Journal of Applied Meteorology, Vol 14, No 6, p 1044-1049, September 1975. 5 fig, 1 tab, 13 ref.

Descriptors: *Nucleation, *Aerosols, *Humidity, Cloud seeding, Condensation, Particle size, Absorption, Adsorption, Equations, Mathematical models, Chemistry, Drops(Fluids), Atmosphere, Electrolytes, Clouds, Precipitation(Atmospheric), Meteorology.

Approximations to the exact equations describing the variation with relative humidity of the equilibrium size of aqueous solution droplets were developed. For relative humidities between 81 and 99.5%, and for droplets formed by particles composed of greater than 60% by mass of any one of nine common electrolytes and having a dry radius in the range of 0.05 to 3.0 micrometer, the approximation formulas presented were accurate to within 5%. Using these formulas, an expression was obtained for the size distribution of a chemically homogeneous aerosol as a function of relative humidity. (Sims-ISWS)
W76-02421

SELECTED CASES OF CONVECTIVE PRECIPITATION CAUSED BY THE METEROPOLITAN AREA OF WASHINGTON, D.C.,
Maryland Univ., College Park. Dept. of Meteorology.
R. P. Harnack, and H. E. Landsberg.
Journal of Applied Meteorology, Vol 14, No 6, p 1050-1060, September 1975. 12 fig, 2 tab, 19 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall disposition, *Cities, Rainfall, Convection, Heating, Temperature, Atmoshpere, Cloud physics, Rain, On-site investigations, Model studies, Meteorology, *District of Columbia.
Identifiers: *Washington(D.C.), Urban effects, Case studies.

The release of isolated summer showers in the Washington, D.C., area, as related to the urban heat island, was studied for nine propitious synoptic situations in 1968, 1972, and 1973. Parcel theory, using urban surface temperature and upper air soundings, permitted comparison between predicted and observed cloud behavior. In all cases the urban thermal effect seemed to be the likely trigger force for shower development. Vertical wind data and cloud energetics permitted an estimate of rainfall positioning in the metropolitan area. In eight of the nine cases, this yielded the correct placing of the urban-induced showers. The study further documented this type of inadvertent rainfall augmentation. Three cases were presented. (Sims-ISWS)
W76-02422

OPTIMIZING RAINFALL ESTIMATES WITH THE AID OF RADAR,
National Severe Storms Lab., Norman, Okla.
E. A. Brandes.
Journal of Applied Meteorology, Vol 14, No 7, p 1339-1345, October 1975, 8 fig, 5 tab, 18 ref.

Descriptors: *Rainfall, *Radar, *Rain gages, *Oklahoma, Measurement, Gaging, Networks, Analytical techniques, Data processing, Estimating, Precipitation(Atmospheric), Precipitation gages, Remote sensing, Weather patterns, Rainfall disposition, Meteorology.
Identifiers: *Radar rainfall measurements, Errors.

Estimates of precipitation are improved when raingage observations are used to calibrate quantitative radar data as well as to estimate precipitation in areas without radar data. Estimated areal precipitation depth errors for nine rainfalls over a 3000 sq km watershed averaged 13 and 14% (1.5 and 1.8 mm) when the radar was calibrated by networks of raingages having densities of one gage per 900 and 1600 sq km. Areal precipitation estimates derived from rainfalls observed at the gages alone produced errors of 21 and 24% (2.5 and 3.0 mm). Adjusting the radar data by a single calibration factor (the simple average ratio of gage-observed and radar-inferred rainfall at all input gages without regard to the spatial variation among ratios) resulted in error reduction to 18% (2.1 mm). Radar data added to gage observations also increased the explained variance in point rainfall estimates above that from gages alone, from 53 to 77% and 46 to 72% for the above gage densities. (Sims-ISWS)
W76-02423

TIME-INTEGRATED RADAR ECHO TOPS AS A MEASURE OF CLOUD SEEDING EFFECTS,
Research Council of Alberta, Edmonton. Atmospheric Science Div.
For primary bibliographic entry see Field 3B.
W76-02424

TOPOGRAPHICAL EFFECTS ON STANDARD NORMALS OF RAINFALL OVER ISRAEL,
Tel-Aviv Univ. (Israel).
N. Wolfson.
Weather, Vol 30, No 5, p 138-144, May, 1975. 1 fig, 5 tab, 7 ref.

Descriptors: *Rainfall, *Topography, *Orography, *Elevation, *Meteorology, Mountains, Climatology, Regression analysis, Correlation analysis, Climates, Arid lands, Regional analysis, Terrain analysis, Precipitation(Atmospheric).
Identifiers: *Israel, Standard normals of rainfa

Evaluation of the relative importance of the t graphical parameters on standard normals of fall was accomplished by employing a stan step-wise regression technique, the BMD Correlations were computed between stan normals of rainfall and the station elevation distance from the Mediterranean Sea, and distance from the northern Israeli border latitude effect). From the results presented, cially from mountainous and data-sparse reg it is apparent that there are two main topograp parameters influencing standard rainfall no over Israel; orography (mountain effects) ha main influence is mountainous regions, whil latitude effect is most important in regions smooth orographies. Distance from the sea not have a large effect on the standard norm rainfall in Israel. (Robinett-Arizona)
W76-02499

COMPUTERIZED REDUCTION METEOROLOGIC MEASUREMENTS F IRRIGATED AND NONIRRIGATED PLOT CENTRAL UTAH,
Brigham Young Univ., Provo, Utah. Dep Zoology.
For primary bibliographic entry see Field 7C.
W76-02500

2C. Snow, Ice, and Frost

MAPPING SNOW EXTENT IN THE S VERDE WATERSHED AND THE SOUTH SIERRA NEVADA USING ERTS IMAGERY
Environmental Research and Technology, Lexington, Mass.
For primary bibliographic entry see Field 7B.
W76-02027

SNOW-EXTENT MAPPING AND LAKE STUDIES USING ERTS-1 MSS TOGET WITH NOAA-2 VHRR,
National Environmental Satellite Se Washington, D.C.
For primary bibliographic entry see Field 7B.
W76-02028

MONITORING ARCTIC SEA ICE USING IMAGERY,
Environmental Research and Technology Lexington, Mass.
For primary bibliographic entry see Field 7B.
W76-02047

APPLICABILITY OF ERTS TO ANTARA ICEBERG RESOURCES,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 7B.
W76-02048

APPLICATIONS OF ERTS-1 IMAGERY TERRESTRIAL AND MARINE ENVIRON TAL ANALYSES IN ALASKA,
Cold Regions Research and Engineering Hanover, N.H.
For primary bibliographic entry see Field 7B.
W76-02049

APPLICATION OF ERTS DATA TO RESO SURVEYS OF ALASKA,
Alaska Univ. College.
For primary bibliographic entry see Field 7C.
W76-02065

ENVIRONMENTAL STUDIES OF AN A ESTUARINE SYSTEM,
Alaska Univ., College. Inst. of Marine Scien
For primary bibliographic entry see Field 2L.

76-02075

NDSAT-1 IMAGERY IN HYDROLOGIC STU-
ES,
ashington Univ., Seattle. Dept. of Civil En-
neering.
r primary bibliographic entry see Field 7B.
76-02163

ALUATION OF ICE MANAGEMENT
OBLEMS ASSOCIATED WITH OPERATION
A MECHANICAL ICE CUTTER ON THE
ISSISSIPPI RIVER,
old Regions Research and Engineering Lab.,
nover, N.H.
r primary bibliographic entry see Field 8C.
76-02396

EASUREMENTS OF THE DIELECTRIC PRO-
RTIES OF WET SNOW USING A
ICROWAVE TECHNIQUE,
old Regions Research and Engineering Lab.,
nover, N.H.
D. Sweeny, and S. C. Colbeck.
vailable from the National Technical Informa-
n Service, Springfield, Va 22161 as AD-A001
0, $4.00 in paper copy, $2.25 in microfiche.
esearch Report 325, October 1974. 31 p, 17 fig, 2
b, 42 ref, 3 append.

escriptors: *Snow, *Electrical properties,
leasurement, Snowmelt, Runoff, Water
uivalent, Water supply, Melt water, Electrical
uipment, Instrumentation, Hydrology.
entifiers: *Dielectric properties, Wet snow.

n accurate method of measuring liquid water in
ow covers is required to determine the proper-
s of wet snow. The dielectric properties of wet
ow must be utilized to adequately measure its
uid water content. In this study the effect of
uid water on the complex dielectric constant of
tural snow was determined in the microwave
equency range. Deloor's method for calculating
e dielectric constant for mixtures and the results
waveguide experiments on samples of wet snow
d glass beads were used to construct a calibra-
n curve relating the measured dielectric loss
ctor directly to the water content of wet snow.
ne results were independent of porosity, past his-
ry, and chemical impurities. A relation between
e effective dielectric constant and the porosity
d water content was proposed and tested experi-
entally. The general nature of this relation was
escribed and suggestions were made for the
evelopment of a more precise relation. It was
ncluded that the dielectric constant is a function
porosity and water content only. (Sims-ISWS)
76-02398

NOW: NATURE'S RESERVOIR,
gricultural Research Service, Boise, Idaho.
orthwest Watershed Research Center.
M. Cox, W. J. Rawls, and J. F. Zuzel.
ater Resources Bulletin, Vol 11, No 5, p 1009-
012, October 1975, 9 ref.

escriptors: *Snow, *Reservoir storage, Snow-
acks, Snowmelt, Watersheds(Basins), Snow
ver, Snow surveys, Water manage-
ent(Applied), Hydroelectric power, Irrigation,
ecreation, Navigation, Stock water, Reservoirs.
entifiers: *Snow water content, Stored water,
atershed research, Snow volume, Power
oduction.

now, one of nature's greatest reservoirs, supplies
ost of the usable water in the western United
tates. Reliable predictions of the quantity and
ming of the release of this water are used in mak-
g management decisions involving irrigation,
ock water and municipal water supplies, hydro-
ower generation, recreation, navigation, and pol-
tion control. Practically oriented research is vital for the proper development and management of this resource. In southwestern Idaho, the Northwest Watershed Research Center is conducting intensive investigations assessing snow volumes, snow water content, and snow-melt over a watershed. Application of these research findings should result in better development and management of the water stored as snow. (Roberts-ISWS)
W76-02412

USE OF AREAL SNOW COVER MEASUREMENTS TO DEVELOP SNOWMELT-RUNOFF RELATIONSHIPS FOR ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
J. S. Aul.
Master of Science Thesis, 1975, 48 p, 11 fig, 4 tab, 25 ref, 3 append.

Descriptors: *Snow cover, *Runoff, *Streamflow forecasting, *Data collections, *Remote sensing, Areal, Snowpacks, Satellites(Artificial), *Arizona, Snowmelt, Runoff forecasting, Measurement, Forecasting.
Identifiers: *ERTS-1 imagery, *Earth Resources Technology Satellites, Black River Watershed(Ariz).

A study was conducted from November 1972 to June 1973 of the Black River Watershed, east-central Arizona, to determine whether ERTS-1 imagery could be used to monitor changes in areal snow cover for use in developing snow cover-runoff relationships for improved streamflow forecasting. Results indicated that despite some difficulties, ERTS-1 imagery could be interpreted for areal snow cover and that a highly significant relationship exists between snow cover measurements and subsequent runoff during the snowpack depletion period. Th two Earth Resources Technology Satellites presently in orbit repreat scans of an area once every nine days, and nearly one-half the scans during the study period were obscured by cloud cover. It was concluded that because of Arizona's shallow intermittent snowpack and the fact that large changes can occur rapidly, ERTS-1 imagery cannot be the sole source of data. Also, the delay in obtaining imagery needs to be overcome. The imagery could be interpreted by employing manual or semi-manual methods which could be available to those who would use snow cover data. (Mills-Arizona)
W76-02453

2D. Evaporation and Transpiration

ASSESSING SOIL-WATER STATUS VIA ALBEDO MEASUREMENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, and R. J. Reginato.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 41-54. 6 fig, 2 tab, 21 ref.

Descriptors: *Soil moisture, *Albedo, *Moisture content, *Soil surfaces, *Evaporation, Topsoil, Water balance, Water loss, Radiation, Soil physical properties, Soil water movement, Drying, Air-earth interfaces, Clay loam, Vegetation effects, Irrigation, Rainfall.
Identifiers: Bare soil albedo, Solarimeters, Soil drying.

Reliable information on soil-water status is required in order to make accurate water balance studies of watersheds, to determine the survival probabilities of various types of vegetation between rainfalls in low rainfall areas, and to determine the susceptibility of the uppermost soil to wind erosion. Simple solarimeters may help to accomplish this objective. Bare soil albedo was a linear function of the water content of a very thin surface layer of soil, and albedo correlated well with water contents of thicker soil layers. In addition, albedo measurements could be used to delineate the 3 classical stages of soil drying. Albedo may also be used to differentiate between the initial potential rate phase of evaporation following an application of water, and the succeeding falling rate phase. Results of applying this technique to a field of Avondale clay loam indicate that 20% to 25% of the water applied by either irrigation or rain will be lost by stage 1 potential evaporation, independent of seasonal variations in evaporative demand. Presently the techniques developed are applicable only to bare soil surfaces. (Robinett-Arizona)
W76-02224

A CONTROLLED ENVIRONMENT SYSTEM FOR MEASURING PLANT-ATMOSPHERE GAS EXCHANGE,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2I.
W76-02277

MODELING SOIL WATER MOVEMENT FOR TRICKLE IRRIGATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W76-02365

ENGINEERING AND ECOLOGICAL EVALUATION OF ANTITRANSPIRANTS FOR INCREASING RUNOFF IN COLORADO WATERSHEDS,
Colorado Univ., Boulder. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3B.
W76-02368

SOYBEAN AND CORN ROOTING IN SOUTHWESTERN MINNESOTA: I. WATER-UPTAKE SINK,
Agricultural Research Service, Pendleton, Oreg.
For primary bibliographic entry see Field 3F.
W76-02403

ESTIMATING ENERGY BUDGET COMPONENTS TO DETERMINE LAKE HURON EVAPORATION,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich., Great Lakes Environmental Research Lab.
S. J. Bolsenga.
Water Resources Research, Vol 11, No 5, p 661-666, October 1975. 2 fig, 3 tab, 22 ref.

Descriptors: *Evaporation, *Lake Huron, Energy budget, Mass transfer, Great Lakes, Energy, Heat flow, Advection, Lakes, Estimating.
Identifiers: *Lake evaporation, *Heat content, Global radiation, Long-wave radiation, Sensible heat, Heat storage, Standard error, Energy storage, Advected heat.

Evaporation was estimated for Lake Huron by the energy budget method and compared to available mass transfer estimates. Data from representative shoreline station measurements and vessel cruise measurements were collected. Agreement between evaporation by the energy budget and by mass transfer was reasonable from February through July, with the exception of May when measurement of the heat content was a problem. For the remainder of the year the disparity was marked. The principal difficulty encountered was the lack of meteorological measurements on the lake and adequate techniques to extrapolate the quantities from shoreline data. Quantitative monthly values for each component in the budget

equation were the first published for Lake Huron and one of the few sets available for the Great Lakes. (Roberts-ISWS)
W76-02425

SIMULATION OF EVAPOTRANSPIRATION AND DRAINAGE FROM MATURE AND CLEAR-CUT DECIDUOUS FORESTS AND YOUNG PINE PLANTATION,
Forest Serice (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
L. W. Swift, W. T. Swank, J. B. Mankin, R. J. Luxmoore, and R. A. Goldstein.
Water Resources Research, Vol 11, No 5, p 667-673, October 1975, 3 fig, 7 tab, 23 ref. NSF AG-199, 40-193-69; NSF AG-389.

Descriptors: *Simulation analysis, *Evapotranspiration, *Drainage, *Deciduous forests, *Pine trees, *Appalachian Mountain Region, Soils, Atmosphere, Oak trees, Hickory trees, Hardwood, Watersheds(Basins), Vegetation, Meteorological data, Seasonal, Soil moisture, *Model studies.
Identifiers: *Phenomenological models, Watershed models.

Prosper, a phenomenological model of water exchange between soil, plant, and atmosphere, was used to simulate evapotranspiration and annual drainage for 2 years from a mature oak-hickory forest in the southern Appalachians. The simulation was tested by comparing drainage to measured streamflow. In a year of unusually high precipitation the simulated annual drainage was within 1.5% of measured streamflow. Simulations were also performed by using the same 2 years of meterologic data, but vegetation parameters were changed to represent a young white pine plantation and a regrowing hardwood forest one year after clear-cutting. The model estimated that drainage for an average rainfall year was reduced 20 cm by a 16-year-old white pine plantation and increased 36 cm by clear-cutting. These results were comparable to changes of -20 and +38 cm observed in watershed experiments at Coweeta Hydrologic Laboratory. Simulated evapotranspiration during the summer was nearly identical for hardwood and pine forests, while winter and early spring water loss was greater for pine. Simulation suggested that the greater evapotranspiration by pine was due to increased interception in all seasons and increased transpiration in the dormant season. For the clear-cut area, simulated evapotranspiration was considerably less than it was for the pine or hardwood forest and thus caused simulated soil moisture contents to be greater during the summer season. (Roberts-ISWS)
W76-02426

2E. Streamflow and Runoff

RETRANSMISSION OF WATER RESOURCES DATA USING THE ERTS-1 DATA COLLECTION SYSTEM,
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 7B.
W76-02032

ERTS-1 FLOOD HAZARD STUDIES IN THE MISSISSIPPI RIVER BASIN,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W76-02033

A REAL TIME DATA ACQUISITION SYSTEM BY SATELLITE RELAY,
Corps of Engineers, Walthan, Mass. New England Div.
For primary bibliographic entry see Field 7B.
W76-02035

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME I. BASINS FROM MERMENTAU RIVER TO COLORADO RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02133

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON MOHAWK RIVER, WHITESBORO, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4A.
W76-02136

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON WEST BRANCH DELAWARE RIVER, DELHI, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4A.
W76-02137

HYDROLOGIC DATA FOR COW BAYOU, BRAZOS RIVER BASIN, TEXAS, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-02145

FLOODS IN THE FAJARDO-LUQUILLO AREA, NORTHEASTERN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 7C.
W76-02150

A DETERMINISTIC MODEL FOR SEMI-ARID CATCHMENTS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. Nnaji, D. R. Davis, and M. M. Fogel.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 163-175. 2 fig, 1 tab, 12 ref.

Descriptors: *Synthetic hydrology, *Semiarid climates, *Watersheds(Basins), *Storm runoff, *Hydrographs, Drainage area, Hydrology, Water sources, Water yield, Storms, Mathematical models, Streamflow, Cloudbursts, Surface runoff, Meteorology, Rainfall-runoff relationships, Hydrograph analysis, Climatic data, Computer models.

Semiarid environments exhibit certain hydrologic characteristics which must be taken into consideration for the effective modeling of the behavior of catchments in these areas. Convective storms, which cause most of the runoff, occur in high intensity and short duration during the summer months and are highly localized so that only a small portion of the catchment actually contributes flow to the storm hydrograph. Also, streams in semiarid catchments are ephemeral with flow occurring only about 1 percent of the time. This study attempts to develop a simple synthetic catchment model that reflects these features of the semiarid environment and for which (1) the simplifying assumptions do not preclude the inclusion of the important components of the runoff process, and (2) parameters of the equations representing the component processes have physical interpretation and are obtainable from basin characteristics so that the model may be applicable to ungaged sites. A reductionist approach is then applied in which the entire catchment is subdivided into a finite number of meshes and the various components of the runoff phenomenon are delineated within each mesh as independent functions of the catchment. Simplified forms of the hydrodynamic equations of flow are used to route flow generated from each mesh to obtain complete hydrograph at the outlet po (Robinett-Arizona)
W76-02235

TOPOLOGICALLY RANDOM CHANNEL NE WORKS IN THE PRESENCE OF ENVIRO MENTAL CONTROLS,
New South Wales Univ., Kensington (Australi School of Geography.
For primary bibliographic entry see Field 8B.
W76-02408

TURBULENT DENSE PLUMES IN A LAMIN CROSS FLOW,
McGill Univ., Montreal (Quebec). Dept. of C Engineering and Applied Mechanics.
For primary bibliographic entry see Field 8B.
W76-02418

SURFACE WATER SUPPLY OF THE UNIT STATES, 1966-70: PART 2. SOUTH ATLANT SLOPE AND EASTERN GULF OF MEXI BASINS--VOLUME I. BASINS FROM JAM RIVER TO SAVANNAH RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02486

HYDROLOGIC UNIT MAP--1974, STATE IDAHO.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02490

HYDROLOGIC UNIT MAP--1974, STATE NEVADA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02491

2F. Groundwater

MAP SHOWING THICKNESS OF THE PER AN (GUADALUPIAN) CAPTAIN AQUIF SOUTHEAST NEW MEXICO AND WE TEXAS,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-02134

GROUND-WATER LEVELS AND WE RECORDS FOR CURRENT OBSERVATI WELLS IN IDAHO, 1974,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W76-02139

HYDROGEOLOGIC AND HYDROCHEMIC FRAMEWORK, SOUTH-CENTRAL GRE BASIN, NEVADA-CALIFORNIA, WITH S CIAL REFERENCE TO THE NEVADA TE SITE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W76-02140

SUMMARY APPRAISALS OF THE NATIO GROUND-WATER RESOURCES--UPPER M SISSIPPI REGION,
Geological Survey, Sacremento, Calif.
For primary bibliographic entry see Field 6B.
W76-02141

LAND SUBSIDENCE DUE TO GROU WATER WITHDRAWAL, ARVIN-MARICO AREA, CALIFORNIA,
Geological Survey, Sacramento, Calif.

LIBRARY U. OF I. URBANA-CHAMPAIGN

or primary bibliographic entry see Field 4B.
76-02142

ROUND-WATER RESOURCES OF THE CAPE ATTERAS NATIONAL SEASHORE, NORTH AROLINA,
eological Survey, Raleigh, N.C.
or primary bibliographic entry see Field 7C.
76-02149

ATER RESOURCES OF THE INNER BASIN F SAN FRANCISCO VOLCANO, COCONINO OUNTY, ARIZONA,
orthern Arizona Univ., Flagstaff.
or primary bibliographic entry see Field 4B.
76-02237

TRUCTURAL RELATIONS DETERMINED ROM INTERPRETATION OF GEOPHYSICAL URVEYS: WOODY MOUNTAIN WELL FIELD, OCONINO COUNTY, ARIZONA,
orthern Arizona Univ., Flagstaff.
or primary bibliographic entry see Field 4B.
76-02238

RELIMINARY INVESTIGATION OF THE YDROLOGIC PROPERTIES OF DIATREMES THE HOPI BUTTES, ARIZONA,
orthern Arizona Univ., Flagstaff.
or primary bibliographic entry see Field 4B.
76-02239

ROUND-WATER RESOURCES OF ACKAWANNA COUNTY, PENNSYLVANIA,
isquehanna River Basin Commission, Harsburg, Pa.; and Pennsylvania State Geological urvey, Harrisburg.
or primary bibliographic entry see Field 4B.
76-02483

ECLAMATION BY TUBEWELL DRAINAGE RECHNA DOAB AND ADJACENT AREAS, UNJAB REGION, PAKISTAN,
eological Survey, Boston, Mass.
or primary bibliographic entry see Field 4B.
76-02484

ROUND-WATER RECONNAISSANCE IN THE RESNO NORTHEAST AREA, FRESNO COUNY, CALIFORNIA,
eological Survey, Sacramento, Calif.
or primary bibliographic entry see Field 4B.
76-02493

ROUND-WATER RESOURCES OF ORANEBURG COUNTY, SOUTH CAROLINA,
eological Survey, Columbia, S.C.
or primary bibliographic entry see Field 4B.
76-02496

DIGITAL-COMPUTER MODEL FOR ESTIATING DRAWDOWNS IN THE SANDSTONE QUIFER IN DANE COUNTY, WISCONSIN,
isconsin Geological Survey, Madison.
or primary bibliographic entry see Field 4B.
76-02498

G. Water In Soils

INETIC MODEL FOR ORTHOPHOSPHATE EACTIONS IN MINERAL SOILS,
nvironmental Protection Agency, Ada, Okla. obert S. Kerr Environmental Research Lab.
or primary bibliographic entry see Field 5D.
76-02073

EFFECT OF VEGETATION ON SOIL HUMIDITY IN EASTERN KARA KUM, (IN RUSSIAN),
Yu. M. Miroshinichenko.
Probl Osvoeniya Pustyn'. 2, 17-22, 1974. (English summary).

Descriptors: *Humidity, Microenvironments, *Vegetation effects, Soil surfaces, *Soil moisture, *Soil-water-plant relationships.
Identifiers: Caaligonum-microcarpum, Calligonum-setosum, Carex-physodes, Ephedra-strobilacea, Haloxylon-aphyllum, Kara-kum, USSR.

The humidity under Haloxylon aphyllum stands differs from that of various plant micro-groups. The humidity of soils in H. aphyllum microgroups (in undercrown areas) exceeds 4-5 times that of soils in Carex physodes microgroups. Humidity in soils under Ephedra strobilacea, Calligonum microcarpum, C. setosum exceeds that of C. physodes. Water accumulation in soils depends on sizes of the undercrown areas deprived of C. physodes under the influence of litter salts.–Copyright 1975, Biological Abstracts, Inc.
W76-02208

ASSESSING SOIL-WATER STATUS VIA ALBEDO MEASUREMENT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2D.
W76-02224

LABORATORY EVALUATION OF WATER-REPELLENT SOILS FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W76-02225

CHAPARRAL SOILS,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
L. F. DeBano.
In: Proc., Symposium on Living with the Chaparral, Riverside, Calif., 1973:19-34, April 1973. Sierra Club, San Francisco.

Descriptors: *Chaparral, *Fire, *Soils, Brush, Burning, Erosion, Fertility, Soil physical properties, Soil chemical properties, Nitrogen, Wettability, Runoff, Infiltration.
Identifiers: *Water repellent soils, *Wildfires, Plant nutrients.

The properties of chaparral soils vary widely, although many of them are shallow and relatively infertile. Wildfires produce changes in these soils which affect both their fertility and erosional properties. During fire, live plant material and the underlying litter are consumed, and the unavailable plant nutrients contained in this material are transformed into highly soluble forms in the remaining ash. These soluble nutrients may be used for subsequent plant growth after the fire or lost by erosion which has been accelerated by the fire. On many burned areas infiltration is decreased by a water-repellent soil condition. Water repellency is produced when organic substances, vaporized by the high fire temperatures (sometimes reaching 1,400F), coat the mineral soil particles. The lower infiltration rate of these burned soils causes water to run off and carry both soil and dissolved plant nutrients with it. The amount of different plant nutrients lost during fire and the impact of these losses on the natural fertility of chaparral areas is currently under study. (Forest Service-USDA)
W76-02282

FOREST SOIL,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
L. F. DeBano.
In: McGraw-Hill Yearbook of Science and Technology, p 204-206, May 1973. McGraw-Hill Book Co., New York.

Descriptors: *Wettability, *Organic matter, Infiltration, Erosion, Fire, Burning.
Identifiers: *Water repellency.

Organic matter is beneficial to clay soils because it aggregates the small particles thereby creating larger soil pores which provide better air and water movement. In contrast, in sandy soil organic matter coats the mineral particles making them water repellent. The decreased wettability restricts infiltration causing runoff and erosion. Water repellency can be produced by wildfires when some of the organic compounds in the plant litter are distilled downward into the underlying soil layers. (Forest Service-USDA)
W76-02283

FIRE IN VEGETATION MANAGEMENT: ITS EFFECTS ON SOIL,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-02284

MODELING SOIL WATER MOVEMENT FOR TRICKLE IRRIGATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. W. Warrick, and D. O. Lomen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 048, $3.50 in paper copy, $2.25 in microfiche. Project Completion Report, October 1975. 17 p, 14 fig, 3 tab, 21 ref. OWRT B-035-ARIZ(5). 14-31-0001-4058.

Descriptors: *Unsaturated flow, Irrigation, *Soil water movement, Equations, Evapotranspiration, Model studies, *Soil moisture, Flow rates, *Arizona, Flow measurement, Measurement, *Mathematical models.
Identifiers: Matric flux potential, *Moisture flow equations, Yuma(Ariz), Sinai Desert, *Trickle irrigation.

Solutions of the time dependent linearized soil moisture flow equation have been completed for point, line, strip, disc and ring sources. These solutions were used to simulate time dependent moisture regimes for various geometries used in trickle irrigation. They are also useful as a check for elaborate finite difference or finite element schemes for solving the non-linear moisture flow equations. For one-dimensional steady state flow, analytical solutions were obtained for seven types of plant water withdrawal functions depending on the flux potential as well as the depth below the surface. The solution of the linearized moisture flow equations with a point source has been compared with the finite difference solution of the non-linear equations of Brandt et al, as well as with field data measured on sandy soil in Yuma and the Sinai. These comparisons were very favorable but demonstrated that care must be taken in applying the model to problems involving large fluxuations in moisture content. Two field experiments for measuring evapotranspiration under trickle irrigation were made in citrus groves near Yuma. The objectives of these measurements were to study the water uptake distribution in the close vicinity of a tree and the microclimate of a grove under trickle irrigation. Data obtained during these field trips will be used to analyze the irrigation policy of the farmers in Yuma and to compare with the predictions of the corresponding mathematical models.
W76-02365

HYGIENIC STANDARDIZATION OF DD AND DDB COMPOUNDS IN WATER BODIES, (IN RUSSIAN),
Novosibirsk Sanitary Research Inst. (USSR).

For primary bibliographic entry see Field 5B.
W76-02406

AN IMPROVED METHOD OF SILICON-32 MEASUREMENT OF GROUNDWATERS,
Physical Research Lab., Ahmedabad (India).
For primary bibliographic entry see Field 4B.
W76-02455

STRATIFIED SAMPLING OF SOIL MOISTURE,
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
D. L. Murray, H. F. R. Lagocki, and R. M. Jackson.
New Zealand Journal of Science, Vol 18, No 2, p 269-276, June, 1975. 3 fig, 2 tab, 7 ref.

Descriptors: *Soil moisture, *Moisture content, *Stratification, *Soil analysis, *Soil horizons, Soil water, Soil physics, Soil types, Gravimetric analysis, Soil physical properties, Slopes, Statistical methods, Sampling, Stratigraphy.
Identifiers: *Stratified sampling, Mosgiel(New Zaland).

The variation of gravimetric moisture content within undrained experimental plots located in the gently rolling phase of Otokia silt loam near Mosgiel, New Zealand is examined. The effects of stratification of each plot into 3 hydrologic response zones are also examined in terms of the precision of the estimate of mean moisture content of the plot. Stratification of the sample of moisture content on the basis of change of slope significantly increased the precision of the estimate of the plot mean. If variability of moisture content in the future is similar to that of the samples analyzed, a sample size of 80 for the A and B horizons and 50 for the AB horizon will ensure a 95 percent confidence interval about the sample mean of not more than 2 percent moisture content. (Robinett-Arizona)
W76-02457

2H. Lakes

INCIDENCE AND CAUSE OF GAS-BUBBLE DISEASE IN A HEATED EFFLUENT,
North Carolina Wildlife Resources Commission, Raleigh.
For primary bibliographic entry see Field 5C.
W76-02006

RESPONSE OF PERCH AND THEIR FORAGE TO THERMAL DISCHARGES IN LAKE ONTARIO,
State Univ. of New York at Buffalo. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-02015

SNOW-EXTENT MAPPING AND LAKE ICE STUDIES USING ERTS-1 MSS TOGETHER WITH NOAA-2 VHRR,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7B.
W76-02028

DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 7B.
W76-02030

APPLICATION OF ERTS IMAGERY TO ENVIRONMENTAL STUDIES OF LAKE CHAMPLAIN,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 7B.
W76-02034.

UPDATING COASTAL AND NAVIGATIONAL CHARTS USING ERTS-1 DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W76-02042

AIRCRAFT AND SATELLITE MONITORING OF WATER QUALITY IN LAKE SUPERIOR NEAR DULUTH,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W76-02051

QUANTITATIVE WATER QUALITY WITH ERTS-1,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5A.
W76-02052

GREAT LAKES WATER QUALITY 1974 ANNUAL REPORT.
International Joint Commission-United States and Canada. Great Lakes Water Quality Board.
For primary bibliographic entry see Field 5G.
W76-02080

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 1. BASINS FROM MERMENTAU RIVER TO COLORADO RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02133

INVESTIFATION OF VERTICAL MIXING IN THE DISPERSION OF POLLUTANTS IN LAKE ERIE,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-02152

NUMERICAL SOLUTION TO A TWO-DIMENSIONAL DISPERSION EQUATION,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-02153

CRITERIA FOR THE USE OF VERTICAL AVERAGING IN GREAT LAKES DISPERSION MODELS,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-02154

CRITERIA FOR THE USE OF VERTICAL AVERAGING IN ENVIRONMENTAL DISPERSION MODELS,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
F. M. Galloway, Jr.
(1975), 40 p, 12 fig, 1 tab, 16 ref, append.

Descriptors: *Model studies, *Dispersion, *Diffusion, *Diffusivity, Velocity, Flow profiles, *Computer models, Path of pollutants, Average flow, Lakes, Rivers, Estuaries.
Identifiers: *Vertical diffusivity.

Vertical averaging, or averaging in a plane perpendicular to the mean flow, in environmental dispersion problems is desirable from the standpoint of efficiency of computer solution. A method is presented, based on computer solution of a model transport problem, for estimating when cross-plane averaging is appropriate. The method is applied to four examples representing typical lake rivers, estuaries and the atmosphere, respectivel The results are correlated in terms of a chara teristic length, velocity and turbulent diffusivit and two dimensionless parameters that depend the velocity and vertical diffusivity profiles. The parameters vary over a relatively small range f the variety of examples that are considered. (S also W76-02152)
W76-02155

CRITERIA FOR THE USE OF VERTICA AVERAGING IN GREAT LAKES DISPERSIO MODELS,
Cleveland State Univ., Cleveland, Ohio. Dept. Chemical Engineering.
F. M. Galloway, and S. J. Vakil.
May 1975, 33 p, 12 fig, 3 tab, 9 ref.

Descriptors: *Computer models, *Model studi *Lake Ontario, Lakes, *Dispersion, Diffusivit *Diffusion, Path of pollutants, Great Lakes.

A basic question in developing a dispersion mo is when can vertical averaging be used to redu the dimensionality of the problem, thus resulti in considerable savings of computer time. A mo problem involving horizontal convection and ve cal diffusion is solved on the computer to establi criteria for vertical averaging. Effective horizon dispersion coefficients (Ke), for use after verti averaging, were computed from the results of t model problem and also from a formula given Csanady. Both methods gave good agreement the values of Ke. Predicted values of Ke as a fu tion of horizontal length scale are in good agr ment with measured horizontal dispersion coef cients from dye release studies in Lake Ontar The mechanism involving vertical shear velocity and vertical diffusion may therefore be important as horizontal turbulence, or more so, producing horizontal dispersion. (See also W 02152)
W76-02156

PHOTOSYNTHETIC ACTIVITY OF I DIVIDUAL ALGAL SPECIES OF THE PLAN TON OF LAKE KRIVOYE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningr Zoologicheskii Institut.
For primary bibliographic entry see Field 5C.
W76-02206

A BACTERIAL WATER QUALITY INVESTIG TION OF CANYON LAKE,
Arizona Univ., Tucson. Dept. of Watersh Management.
For primary bibliographic entry see Field 5B.
W76-02232

TIME-RELATED CHANGES IN WATE QUALITY OF STOCK TANKS OF SOUTHEAS ERN ARIZONA,
Agricultural Research Service, Tucson, Ar Southwest Watershed Research Center.
For primary bibliographic entry see Field 5B.
W76-02233

EVALUATION OF MATHEMATICAL MODE FOR TEMPERATURE PREDICTION IN DE RESERVOIRS,
Vanderbilt Univ., Nashville, Tenn.
For primary bibliographic entry see Field 5B.
W76-02270

SUMMER DISTRIBUTION OF TI NEARSHORE FISH COMMUNITY NEAR THERMAL GENERATING STATION DETERMINED BY ACOUSTIC CENSUS,
Canada Centre for Inland Waters, Burlingt (Ontario); and Fisheries and Marine Service, tawa (Ontario). Great Lakes Biolimnology Lab.
For primary bibliographic entry see Field 5B.

LIBRARY U. OF I. URBANA-CHAMPAIGN

5-02321

MOTE SENSING OF WATER QUALITY IN
IRIE LAKES,
th Dakota State Univ., Brookings. Dept. of
any and Biology.
primary bibliographic entry see Field 5A.
5-02363

ALUATING A MATHEMATICAL MODEL
R PREDICTING LAKE EUTROPHICATION,
ginia Univ., Charlottesville. Dept. of Environ-
tal Sciences.
primary bibliographic entry see Field 5C.
5-02370

RIZONTAL TURBULENT ENERGY
NSFER ASSOCIATED WITH A GREAT
KES COASTAL CURRENT,
consin Univ., Madison. Marine Studies
ter.
Green, and L. A. Yeske.
us, Vol 27, No 4, p 384-396, 1975, 10 fig, 4 tab,
ef. NSF 33140, NASA NGL 50-005-127.

criptors: *Turbulent flow, *Energy transfer,
ke Superior, Great Lakes, Photogrammetry,
ial photography, Reynolds number, Kinetics,
w, Winds, Lakes, Currents(Water).
ntifiers: *Turbulent energy, *Coastal current,
weenaw current, Kinetic energy, Wind
ction, Cross-current winds.

small-scale surface structure of the
weenaw Current in Lake Superior was mea-
ed using aerial photogrammetric techniques
eral times during the summers of 1971 and
2. The transfer of kinetic energy from the mean
v by the action of the Reynolds stresses was
ulated. Energy transfers both to and from the
n flow occurred, and were a significant frac-
of the mean kinetic energy. The results sug-
ted that such transfers result mainly in a long-
rent redistribution of energy. The direction of
rgy transfer may have been related to wind
ction; along-current winds occurred in con-
ction with transfer from the mean flow, cross-
rent winds with transfer to the mean flow.
berts-ISWS)
6-02411

RTICAL PATTERNS OF EDDY DIFFUSION
RING STRATIFICATION IN CASTLE LAKE,
LIFORNIA,
ifornia Univ., Davis. Div. of Environmental
dies; and California Univ., Davis. Inst. of
logy.
assby, and T. Powell.
nology and Oceanography, Vol 20, No 4, p
-543, July 1975. 3 fig, 4 tab, 36 ref.

scriptors: *Diffusion, *Lakes, *California,
ratification, Dispersion, Turbulent flow, Heat
nsfer, Thermodynamics, Radiation, Solar radia-
. Eddies.
ntifiers: *Eddy diffusivity, *Temperature dis-
ution, Radiation flux, *Castle Lake(Calif),
ar spectrum, Brunt-Vaisala frequency.

vertical eddy diffusivity for heat, Kz, which
racterized the intensity of vertical mixing, was
mated for depths below the epilimnion in Cas-
Lake, California, calculated from a series of
perature profiles collected during summer 1972
ably corrected for solar radiation absorption.
was usually much larger than the molecular
ue of diffusivity, indicating that thermal energy
ansported in the vertical almost entirely by tur-
ent mechanisms, even below the epilimnion.
ther, Kz varied significantly with depth and
well described in the region of high stratifica-
by the form log (Kz) = log b + m log (sq. N),
ere m = -0.40 + or - 0.02 and N squared =
unt-Vaisala frequency) squared, a result close
previous theoretical prediction. (Lee-ISWS)

W76-02414

ESTIMATING ENERGY BUDGET COMPONENTS TO DETERMINE LAKE HURON EVAPORATION,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich., Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2D.
W76-02425

REPORT TO INTERNATIONAL JOINT COMMISSION, UNITED STATES AND CANADA, GREAT LAKES WATER QUALITY,STATUS OF PERTINENT EPA RESEARCH,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W76-02451

AN EVALUATION OF THE RAINBOW TROUT-WARMWATER SPECIES FISHERY IN PARKER CANYON LAKE,
Arizona Univ., Tucson. School of Renewable Natural Resources.
L. E. Otte.
Master of Science Thesis, 1975, 53 p, 11 fig, 5 tab, 29 ref, 5 append.

Descriptors: *Rainbow trout, *Fish, *Arizona, *Fsh management, *Fish stocking, Trout, Cold-water fish, Sport fish, Fishing, Channel catfish, Bass, Sunfishes, Fish conservation, Fish physiology, Fish populations, Fisheries, Ecology, Environmental effects, Warm-water fishing, Cold-water fishing, Recreation, Dissolved oxygen, Water temperature, Lakes.
Identifiers: *Parker Canyon Lake(Ariz).

Parker Canyon Lake, located in southeastern Arizona at an elevation of 1636 meters, was studied in relation to the biology and harvest of the stocked rainbow trout and their compatibility with the warmwater species of channel catfish, largemouth bass, green sunfish and bluegill, from October 24, 1973 through November 1, 1974. After stocking, the trout dispersed to the littoral areas around the lake, feeding primarily on zooplankton during the winter (December-February) and on midge pupae or larvae during the spring (March-May). Five monthly stockings of 8- to 10-inch rainbow trout began in November and by the end of April, 90 to 95 percent of all trout had been harvested from the lake. During the summer, dissolved oxygen was at least 3mg/l and temperature was 21C or less at a depth of 6 to 7 m. The littoral plant beds provided the warmwater species with food, cover and spawning sites throughout the year. Although food and habitat overlap occurred between rainbow trout and warmwater species, it did not adversely affect the fish, and the fishery of Parker Canyon Lake was biologically compatible. Stockings of rainbow trout only in the cooler months (December through February) would provide more fish for recreation by stimulating anglers to fish for warmwater species later in the fall and earlier in the spring, and thus maintain year-round fishing in the lake. (Robinett-Arizona)
W76-02454

THE PHYTOPLANKTON OF CANYON LAKE, ARIZONA,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W76-02459

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS--VOLUME 1. BASINS FROM JAMES RIVER TO SAVANNAH RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.

W76-02486

LIMNOLOGICAL DATA FOR DONNER LAKE, CALIFORNIA, MAY 1973 THROUGH DECEMBER 1973,
Geological Survey, Sacramento, Calif.
A. E. Dong.
Open-file report, September 1975. 51 p, 2 fig, 11 tab, 5 ref.

Descriptors: *Limnology, *Lakes, *California, Basic data collections, Physical properties, Chemical properties, Biological properties, Lake morphology, Lake morphometry, Sampling, Chemical analysis, Hydrology.
Identifiers: *Donner Lake(Calif).

Data were collected in the spring of 1973 for definition of certain physical, chemical, and biological characteristics of Donner Lake, Calif. The lake probably was in an unenriched condition at the time of the study. Any future changes in the lake, caused by natural or human influences, can be related to the conditions documented in this report. Donner Lake in Nevada County is about 80 miles northeast of Sacramento. The lake has a surface area of 1.5 sq mi and lies at an altitude of 5,935 ft above mean sea level. The lake is regulated by a small dam and has a usable capacity of 9,500 acre-ft of water. The 14 sq mi drainage area consists of mostly coniferous forests. Three major inlets, Lakeview Creek, Billy Mack Creek, and Negro Creek, enter the lake from the west end of the lake. Donner Creek, outlets of the lake, received lake water below the dam at the east end of the lake and flows eastward into the Truckee River. The climate of Donner Lake basin is of highland type--winters are cold with abundant snowfall, and subzero temperatures are often recorded. The long-term average temperature is 26 deg F (-3 deg C) in January. Summers are cool and dry with a long-term average July temperature of 62 deg F (16 deg C). Long-term average annual percipitation is about 45 in. Average annual evaporation from the lake is about 36 in. Water samples were collected once monthly during May, August, October, and December; and twice monthly during June and July. (Woodard-USGS)
W76-02487

LIMNOLOGICAL DATA REPORT FOR THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION--U.S. GEOLOGICAL SURVEY COOPERATIVE LAKE STUDIES PROJECT,
Geological Survey, Augusta, Maine.
For primary bibliographic entry see Field 7C.
W76-02492

FOSSIL FISHES FROM THE PLICENE OR PLEISTOCENE CACHE FORMATION, LAKE COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. W. Casteel, and M. J. Rymer.
Journal of Research of the U S Geological Survey, Vol 3, No 5, p 619-622, September-October 1975. 2 fig, 26 ref.

Descriptors: *Lakes, *Fish, *Geologic time, *Pleistocene Epoch, *California, Freshwater fish.
Identifiers: *Lake County(Calif), *Fossil fishes, Cache formation, Fossil-current fish relationships.

The remains of fossil fishes comprising three species were found in the Cache Formation in Lake County, Calif. The rocks containing the fossils are considered to be late Pliocene or early Pleistocene. The species are all freshwater and primarily quiet-water types that now live in Clear Lake and the waters of the surrounding area, suggesting continuity between the present lake and a lake represented by the rocks of the Cache Formation. (Woodard-USGS)
W76-02495

2I. Water In Plants

SOME NEW ASPECTS OF PLANT INDICATION OF HYDROGEOLOGICAL CONDITIONS IN DESERTS, (IN RUSSIAN),
S. G. Laricheva.
Ekologiya, Vol 5, No 4, p 38-42, 1974.

Descriptors: *Deserts, *Hydrologic aspects, *Desert plants, *Groundwater, *Water utilization, Evaporation, Infiltration, Equilibrium, Transpiration.
Identifiers: Water exchange, Desuction.

In the light of new concepts on the types of water exchange in the zone of aeration, concepts of the interrelation between various ecological groups of sand desert plants and groundwater are examined. The possibility of plant indication of 4 types of water exchange in the zone of aeration is discussed. These are: the evaporative type, which indicates the expenditure of groundwater primarily due to physical evaporation; the infiltration type in which groundwater is supplied mainly by precipitation; the equilibrium type characterized by the absence of precipitation and consumption of groundwater; and the 'desuctive' type of water exchange which presumes the consumption of groundwaters by their 'desuction' (uptake by roots) and transpiration during physiological activity of plants.--Copyright 1975, Biological Abstracts, Inc.
W76-02003

SODIUM RELATIONS IN DESERT PLANTS: 3. CATION-ANION RELATIONSHIPS IN THREE SPECIES WHICH ACCUMULATE HIGH LEVELS OF CATIONS IN LEAVES,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3C.
W76-02158

EFFECT OF VEGETATION ON SOIL HUMIDITY IN EASTERN KARA KUM, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W76-02208

STOMATAL MOVEMENT AND WATER RELATIONS IN CROPS: 2. STOMATAL BEHAVIOR OF TOBACCO LEAVES OF DIFFERENT AGES AND THE INFLUENCE OF SOIL WATER SHORTAGE, (IN JAPANESE),
Ehime Univ., Matsuyama (Japan). Coll of Agriculture.
S. Jodo.
Proc Crop Sci Soc Jap, Vol 42, No 1, p 123-130, 1973.

Descriptors: *Stomata, Crop production, *Leaves, *Tobacco, Soil moisture, Light, Solar radiation, *Xylem.
Identifiers: *Soil moisture stress(Plants).

Diurnal stomatal behavior was studied in 3 leaves (an upper immature, a middle immature, and a lower mature leaf) of a potted tobacco plant under greenhouse conditions using recording porometers, for 3 days. The effect of soil moisture stress (pF) upon stomatal behavior was also examined. Every morning, pre-dawn opening was evidently in the upper and middle immature leaves, but was hardly seen in the lower mature leaf. Stomatal opening markedly increased in every leaf with increasing light intensity after sunrise even under high soil moisture stress. The time of peak stomatal opening appeared earlier as the leaf became older. In the case of the immature leaf, the same phenomenon was seen under highest pF condition. These peaks showed a sharp shape by the shortening of their width (opening period) due to the occurrence of midday closure. The lower mature leaf showed marked midday closure of stomata at high light intensity even mild soil moisture stress pF 3.10, but the upper immature leaf scarcely showed midday closure. Soil moisture stress increment promoted the development of midday closure in depth and length in every leaf, especially in the upper and middle immature leaves. Average stomatal opening and opening period decreased with increasing leaf age and soil moisture stress. This resulted because a leaf water deficit was produced by internal (leaf age) and external (pF) conditions, and such deficit caused the midday closure and the suppression of reopening of tobacco stomata. A marked difference was found between the forenoon stomatal opening curve and the afternoon stomatal closing curve within the middle and lower leaves. Photoactive opening (including hydropassive opening) after sunrise and midday closure (hydroactive closing) under strong solar radiation occurred simultaneously in the tobacco stomata in 3 leaves. Such synchronism suggests that these stomatal behaviors were associated with the variation of xylem hydraulic tension.--Copyright 1974, Biological Abstracts, Inc.
W76-02252

CONIFEROUS STANDS CHARACTERIZED WITH THE WEIBULL DISTRIBUTION,
Forest Service (USDA) , Coweeta Hydrologic Lab. Franklin, N.C.
H. T. Schreuder, and W. T. Swank.
Canadian Jounral of Forest Research, Vol 4, No 4, p 518-523, July 1974. 6 p, 1 fig, 5 tab, 15 ref.

Descriptors: *Coniferous trees, *Statistical models, *Canopy, White pine trees, Loblolly pine trees, Biomass, North Carolina.
Identifiers: *Stand structure.

The Weibull distribution equation was employed to summarize diameter, basal area, surface area, biomass, and crown profile distribution data well for several different ages of white and loblolly pine plantations. The data for diameter, basal area, surface area, and biomass were easily summarized by this one distribution in a theoretically consistent fashion. This is not possible with the normal and the gamma distributions, and the lognormal gives less satisfactory results. The distribution function should prove useful in modeling tree stands since only the parameter values need to be change over time for the above variables. The change in these parameters may be a good way to characterize and interpret changes in stands over time. (Forest Service-USDA)
W76-02276

A CONTROLLED ENVIRONMENT SYSTEM FOR MEASURING PLANT-ATMOSPHERE GAS EXCHANGE,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
James M. Brown.
U.S.D.A. Forest Serv. Res. Note NC-189, 4 p, 1975.

Descriptors: *Laboratory equipments, Equipment, *Transpiration, *Transpiration control, Plant physiology, Methodology.
Identifiers: Controlled environment system, Gas exchange, Tree seedlings.

Describes an inexpensive, efficient system for measuring plant-atmosphere gas exchange. Designed to measure transpiration from potted tree seedlings, it is readily adaptable for measuring other gas exchanges or gas from plant parts. Light level, air and root temperature can be precisely controlled at minimum cost. (Forest Service-USDA)
W76-02277

NEW CONCEPTS ON THE WATER REGIME OF PLANTS OF THE KARA KUM DESERT, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
V. M. Sveshnikova.
Ekologiya, 5(4), 27-31, 1974.

Descriptors: *Plant growth, *Desert pla *Deserts, *Arid climates, *Water requireme Transpiration, Regime
Identifiers: Kara-Kum desert, USSR.

A comprehensive characterization of the w regime of plants (30 spp.) of the Kara-Kum de (USSR) is given and the diversity of forms of p adaptation to arid conditions is discussed. transpiration of trees and shrubs in the dese lower than transpiration of herbaceous ann Long-vegetating plants are characterized by saturation deficit values; the water deficit is only in the leaves of ephemerals.--Copyright Biological Abstracts, Inc.
W76-02317

SIMULATION OF EVAPOTRANSPIRAT AND DRAINAGE FROM MATURE CLEAR-CUT DECIDUOUS FORESTS YOUNG PINE PLANTATION,
Forest Serice (USDA), Franklin, N.C. Cow Hydrologic Lab.
For primary bibliographic entry see Field 2D.
W76-02426

GERMINATION RESPONSES OF A NEW M ICO POPULATION OF PARRY AG (AGAVE PARRYI ENGLEM. VAR. PARR TO CONSTANT TERMPERATURE, WA STRESS, AND PH,
Texas Univ. at El Paso. Dept. of Biolo Sciences.
C. E. Freeman.
Southwestern Naturalist, Vol 20, No 1, p 6 May 15, 1975. 2 fig, 10 ref.

Descriptors: *Germination, *Viability, *D plants, *Soil-water-plant relations *Environmental effects, Water requirem Plant growth, Dormancy, Drought resista Moisture stress, Reproduction, Seeds, *New ico, Predation.
Identifiers: Parry agave(Agave parryi), See establishment, Constant temperature.

Since little is known about the germin requirements and tolerances of desert plant cies, this study was undertaken to determine factors might be responsible for the apparent success of seedling establishment of Parry a (Agave parryi). Five plants were selected fr population in the Sacramento Mountains, Mexico, and germination trials conducted. timum constant temperature was near 25C. mination was delayed progressively at stresses to -5.0 bars, virtually ceasing at -10 and was best at a pH of 7.0 to 8.0, declining a Preliminary studies indicated that A. parryi s have no dormancy requirements and germ equally well on or buried beneath the soil sur It was concluded that paucity of A. p seedlings under field conditions is due to such tors as drought, high temperatures, and preda and that seedling survival would occur durin favorable rainy, cool periods which occur dec apart, vegetative reproduction being most im tant between those unusual years. (Mills-Arizo
W76-02456

INVESTIGATION OF DIATOM POPULATI IN RHITRON AND POTAMON COMMUNI IN OAK CREEK, ARIZONA,
Northern Arizona Univ., Flagstaff. Dept Biological Science.
For primary bibliographic entry see Field 5A.
W76-02458

LIBRARY U. OF I. URBANA-CHAMPAIGN

Erosion and Sedimentation

LITY OF SURFACE WATERS OF THE TED STATES, 1970: PART 3. OHIO RIVER IN.
ogical Survey, Reston, Va.
primary bibliographic entry see Field 7C.
-02132

WOOD NATIONAL PARK STUDIES DATA EASE NUMBER 1: REDWOOD CREEK, MBOLDT COUNTY, CALIFORNIA, SEP-MBER 1, 1973-APRIL 10, 1974,
ogical Survey, Menlo Park, Calif.
primary bibliographic entry see Field 7C.
-02144

GE SCALE COLOR PHOTOGRAPH FOR SION EVALUATIONS ON RANGELAND TERSHEDS IN THE GREAT BASIN,
ada Univ., Reno.
Tueller, and D. T. Booth.
Papers from the Fall Convention, American ety of Photogrammetry, October 26-31, 1975. Church, Virginia, p 708-753, (1975), 11 fig, 7 35 ref, 3 append.

riptors: *Remote sensing, *Aerial photog-y, *Soil erosion, *Arid lands, *Great Basin, ion, Semiarid climates, Watersheds(Basins), surfaces, Wind erosion, Rill erosion, Erosion , Gullies, Geomorphology, Topography, y erosion, Costs, Ranges, Land management, eys, Terrain analysis.
tifiers: Stereo photography, Flow patterns, r movement, Vesicular horizons.

practicability of using vertical, aerial photog-y to study erosion conditions on arid and arid range watersheds in the Great Britain was ied. Large scale (1:600) 70 mm sequential photographs in stereo pairs were used. Soil ce factors, applicable to erosion, which were ed using aerial photography included flow rns, wind erosion, litter movement, vesicular ons, bare ground, rills, and gullies. Using factors, ground observations were compared photographic data to develop descriptions, , and guidelines for the interpretation of each on condition. The interpretation guidelines loped lead to evaluations that are at least as rate as those currently being obtained on the nd. Costs involved in flight time and in-etation averaged less than 0.025 dollars per (0.01 dollars per acre). (Robinett-Arizona)
-02161

LICABILITY OF THE UNIVERSAL SOIL S EQUATION TO SEMIARID RANGELAND DITIONS IN THE SOUTHWEST,
cultural Research Service, Tucson, Ariz. hwest Watershed Research Center.
Renard, J. R. Simanton, and H. B. Osborn.
Vol 4: Hydrology and Water Resources in ona and the Southwest, Proceedings of the Meetings of the Arizona Section, American r Resources Association and the Hydrology on, Arizona Academy of Science, April 19-974, Flagstaff, Arizona, p 18-32. 6 fig, 2 tab, f.

riptors: *Sediment yield, *Semiarid climates, sion rates, *Soil erosion, *Estimating equa-, Sediment discharge, Sedimentation rates, ments, Sediment load, Ranges, Range gement, Southwest U. S., Rainfall, Surface ff, Rainfall-runoff relationships, Slopes, Ero-control, Channel morphology, Small rsheds, *Arizona, Erosion.
ifiers: Soil loss, Sediment yield prediction, ut Gulch Experimental Watershed(Ariz), ersal Soil Loss Equation.

An erosion prediction method that has recently received wide attention in the United States is the Universal Soil Loss Equation which is given as: A=RKLSCP. Where A = estimated soil loss (tons/acre/year), R = a rainfall factor, K = a soil erodibility factor, L = a slope length factor, S = a slope gradient factor, C = a cropping-management factor, and P = an erosion control practice factor. Data collected on the Walnut Gulch Experimental Watershed in Southeastern Arizona were used to estimate these factors for semiarid rangeland conditions. The equation was then tested with data from watersheds of 108 and 372 acres. The predicted value of annual sediment yield was 1.29 tons/acre/year as compared with an average 1.64 tons/acre/year for 4 years of data for the 108-acre watershed, and a sediment yield of 0.39 tons/acre/year was predicted for the 372-acre watershed as compared with the measured value of 0.52 tons/acre/year. Although good agreement was noted between predicted and actual sediment yield, additional work is needed before the equation can be applied to other areas of the Southwest. (Robinett-Arizona)
W76-02222

UNCERTAINTY IN SEDIMENT YIELD FROM A SEMI-ARID WATERSHED,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
J. H. Smith, M. Fogel, and L. Duckstein.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 258-268. 3 fig, 13 ref, append.

Descriptors: *Sediment yield, *Semi-arid climates, *Soil erosion, *Estimating equations, *Synthetic hydrology, *Rainfall-runoff relationships, Erosion rates, Sediment discharge, Erosion, Sedimentation rates, Sediments, Sediment load, Range management, Southwest U.S., *Arizona, Rainfall, Surface runoff, Rainfall-runoff relationships, Small watersheds, Streamflow, Mathematical models, Planning.
Identifiers: Storm duration, Atterbury watershed(Tucson Ariz), Peak flow, Universal Soil Loss Equation.

A stochastic model is presented for the prediction of sediment yield in a semi-arid watershed based on rainfall data and watershed characteristics. Random variables which lead to uncertainty in the model are rainfall amount, storm duration, runoff, and peak flow. Soil Conservation Service formulas are used to compute the runoff and peak flow components of the Universal Soil Loss Equation, and a transformation of random variables is used to obtain the distribution function of sediment yield from the joint distribution of rainfall amount and storm duration. Applications of the model are in the planning of reservoirs and dams where the effective lifetime of the facility may be evaluated in terms of storage capacity as well as the effects of land management of the watershed. In order to calibrate the model and to evaluate the uncertainties involved, experimental data from the Atterbury watershed near Tucson, Arizona were used. (Robinett-Arizona)
W76-02240

A PHOTOGRAPHIC TECHNIQUE FOR MONITORING EROSION ON STRIP MINED LANDS,
Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 5A.
W76-02278

FOREST SOIL,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-02283

THE HYDROLOGY OF CHAPARRAL WATERSHEDS,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-02286

MASS-WASTING PROCESSES IN WATERSHED MANAGEMENT,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-02287

RELATION OF RESERVOIR SEDIMENTATION TO CATCHMENT ATTRIBUTES, LANDSLIDE POTENTIAL, GEOLOGIC FAULTS, AND PREDICTED DENSITY,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. W. Anderson.
In: International Symposium on the Hydrologic Characteristics of River Basin and the Effects on these Characteristics of Better Water Management. Proc. Tokyo Symposium December 1975, Int. Assoc. Sci. Hydrol. Pub. No. 117, 629-638, 1975.

Descriptors: *Erosion, *Deposition, *Sedimentation, Landslides, Geologic faults, Soil physical characteristics, Snow, Geology, Streamflow, Forest fires, Roads, Highways, Reservoirs, Watershed management, Geomorphology, Elevation, Slope, Forests, Brushlands, Flood frequency.
Identifiers: *Rural roads, *Grazing, *Trap efficiency(Reservoirs), Watershed shape, Channel slope.

A basis was developed for normalizing reservoir deposition accumulated during periods of widely different streamflow sediment producing potential in northern California. Long term records of the product of yearly mean and yearly maximum daily streamflow from nearby streams was used as a normalizing variable. The normalized sediment measurements in reservoirs were found related to streamflow, rain-snow frequency, road standards and locations, forest fire, and physiography. Deviations from this relation were found to occur with differences among watersheds in landslide classes on a published map of the U.S. Geological Survey, with extent of faults indicated on state geologic maps, and with reservoir density predicted from Wallis-Willen geology-soil-texture relations and Koelzer-Lara-Miller relations. Reduced rank principal component analyses were used throughout in the evaluations. The final prediction equation had an R2 of 0.86 and a standard error of estimate of 0.138 log units. Variations in average annual reservoir deposition associated with predicted density was 39 percent, with landslides 100 percent, with faults 41 percent, and with clay content by 32 percent, but only 38 percent with precipitation variation after adjustment to long-term flow and rain-snow frequency. Combinations of geologic rock-type and geologic faults and landslide potential have a predicted sediment rate as much as 17 times that of non-fault areas. (Forest Service-USDA)
W76-02288

SEDIMENTATION AND TURBIDITY HAZARDS IN WILDLANDS,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. W. Anderson.
In: Watershed Management, ASCE-1975 Proc. Watershed Management Symposium, Division of Irrigation and Drainage, Amer. Soc. Civil Engineers, Logan, Utah, August 11-13, 1975:347-376.

Descriptors: *Sedimentation, *Water quality, *Erosion, Landslides, Bank erosion, Roads, Topography, Geology, Suspended sediment,

Reservoir deposition, Turbidity, Forest fires, Logging, Lumbering, Watershed management, Geologic faults, Density of sediments, Streamflow frequency, Geology, Soil physical characteristics, Vegetation, Regression analysis, Principal component analysis.
Identifiers: Flood effects, Erodibility, Surface-aggregation ratio, Rain-snow frequency.

Results of current and older studies are reported to illustrate how sedimentation and streamflow turbidity hazards can be evaluated. Indices of sediment hazards, production coefficients that alter those hazards, and techniques for appraising sediment potential, both in terms of suspended sediment and in reservoir deposition, are applied. A system for selecting sediment and water quality units and defining a unit area on which water quality might be monitored and sedimentation predicted is developed. Five subsystems characterize the basic sediment producing potential of meteorological, geologic, topographic, vegetative, and land use condition. Another subsystem can be used to adjust to the full 81-year records, sedimentation measured during different periods. This was done by 'normalizing' the effects of streamflow, snowfall, elevation, and latitude in relation to rain-snow frequency. Coefficients have been developed for predicting the expected effects of logging, road building, forest fires, conversion of steep forest or brushland to grass, unstable stream channels, landslides, and geologic faults on sedimentation. (Forest Service-USDA)
W76-02289

RELATIVE CONTRIBUTION OF SEDIMENT FROM SOURCE AREAS AND TRANSPORT PROCESSES,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
H. W. Anderson.
In: Present and Prospective Technology for Predicting Sediment Yields and Sources. Proceedings Sediment-Yield Workshop, USDA Sediment Lab., Oxford, Miss., Nov. 28-30, 1972. U.S. Agric. Res. Serv. (Rep) ARS-S-40, p 66-73, 1975. 2 fig, 15 ref.

Descriptors: *Erosion, *Suspended sediment, *Sediment transport, *Sediment yield, Water quality, Turbidity, Bank erosion, Bedload, Mass wasting, Landslides, Watershed management, Lumbering, Forest fires, Soil texture, Channel morphology, Stream erosion, Headwaters, Vegetation effects, Brush control, Roads, Washouts, Slope stability, Geology, Abrasion.
Identifiers: Soil creep, Flood effects, Erodibility, Surface-aggregation ratio, Channel armouring.

Typically forest soils show wide variation in physical characteristics associated with the geologic origin of the parent material and variation in weathering processes. Soils anchored by tree roots often occupy slopes which would be beyond the natural angle of repose for the geologic material. The steep slopes are subject to an erosional process that consists of channel cutting over long periods, mass soil creep, and soil occasionally sliding from lower slopes into the channel. Each of these can be affected by land use. A study of suspended sediment discharge from 23 California watersheds estimated the following increases in sediment production associated with present average land uses as contrasted with absences of such land use in the watersheds: Conversion of 14.8 percent of steep forest and brush lands to grassland had multiplied sediment by 4.7; fires in the last 10 years on 5.3 percent of the watershed areas multiplied sediment by 2.3; 'poor logging' of 1.4 percent of the area increased sediment by 26 percent; and conversion of 0.6 percent of a watershed into low standard roads increased sediment by 24 percent. Thus, associated with these four factors of man's use was a total increase in sediment by a factor of 17 times. Under such conditions major floods can contribute to further deterioration in watershed conditions, as indicated by increased average sediment concentration. Sediment concentration, for like flows, was 2 to 3.7 times greater after the 1965 flood than before. High-elevation watersheds suffered more than low-elevation watersheds; sediment increases in high-elevation watersheds averaged three times that in low-elevation watersheds. (See also W75-05926) (Forest Service-USDA)
W76-02290

SOURCES AND SEDIMENT YIELD OF HAWAIIAN WATERSHED AND COASTAL SEDIMENTS,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
P. Fan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 045, $3.50 in paper copy, $2.25 in microfiche. Completion Report, (1975). 12 p, 6 fig, 11 ref. OWRT A-043-HI(3). 14-31-0001-5011.

Descriptors: *Sedimentation, *Clay minerals, Water pollution, Erosion, *Hawaii, Estuaries, Bays, Lagoons, Tidal streams, *Sinks, Watersheds(Basins), Environment, *Sediment yield, Sediment transport.
Identifiers: *Coastal sediments, Coastal environment.

The mineral composition as well as the texture of Hawaiian watershed and coastal sediments is dependent on various parameters. Geology, climatology, vegetation, stream slope and channel morphology, bathymetry, and cultural activities are important. Hawaiian streams enter the ocean basin through one of the following kinds of environment: estuaries, bays, lagoons, or mouths of tidal streams. The coastl environments serve as temporary sinks for the tidal streams. The coastal environments serve as temporary sinks for the sediments. Four representative watershed coastal environments from Oahu were selected for detailed study. They were Kahana, Kaneohe, Hawaii Kai, and Pearl Harbor.
W76-02369

SEDIMENT TRANSPORT IN SMOOTH FIXED BED CHANNELS,
Newcastle upon Tyne Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-02409

PREFERRED POSITION MODEL AND SUB-SURFACE SYMMETRY OF VALLEYS,
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2A.
W76-02410

A CONTRIBUTION TO THE STUDY OF VORTEX RIPPLES,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 8B.
W76-02419

2K. Chemical Processes

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02132

CHEMICAL COMPOSITION OF RAINFALL AT SELECTED SITES IN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
F. Quinones-Marquez.
Open-file report 75-364, 1975, 17 p, 6 fig, 1 tab, 9 ref.

Descriptors: *Water quality, *Rainfall, *Pu Rico, *Surface waters, Data collections, Sur runoff, Rain water, Dissolved solids, Chem analysis, Chlorides, Calcium, Bicarbonates, W analysis, Moisture uptake, Oceans.
Identifiers: Atmospheric ocean salts

Chemical analyses of rainfall were made for m constituents in samples collected at about mo intervals from 1963 to 1967 from four locatio Puerto Rico. Mean values and other statistics computed for chloride, bicarbonate, and calc which are the major ions in the rainfall. values for chloride, bicarbonate, and cal range from 2.8 to 5.0 milligrams per litre, 4.3 milligrams per litre, and 1.0 to 1.8 milligram litre, respectively. There is a higher concentr of dissolved solids during the dry season than ing the wet season. Poor correlation (r=0.20) found between the amount of rainfall an specific conductance. The data show that ther general decrease in the dissolved-solids conce tion in rainfall from east to west across the isl The ions present in rainfall contribute significa to the quality of surface waters. Computatio two basins show that virtually all the chlorid streamflow may be supplied from rainfall. tributions from rainfall range from 7 to 15 per for calcium, and from 16 to 63 percent for nesium. Sulfate contributions from rainfall r from 54 to 62 percent of the streamflow out (Woodard-USGS)
W76-02135

WATER-QUALITY ASSESSMENT OF THE DIANA DUNES NATIONAL LAKESHORE, I 74,
Geological Survey, Indianapolis, Ind.
L. D. Arihood.
Available from the National Technical Info tion Service, Springfield, Va 22161 as PB-245 $4.50 in paper copy. $2.25 in microfiche. W Resources Investigations 14-75, 1975. 56 p, 10 5 tab, 13 ref.

Descriptors: *Water quality, *Nati lakeshores, *Indiana, *Water supply, *Chem analysis, Data collections, Sampling, Sur waters, Groundwater, Marshes, Dunes, W chemistry, Nutrients, Aquatic microbiol Trace elements, Insecticides, Chemistry precipitation, Hydrogeology, Water pollu sources.
Identifiers: *Indiana Dunes National Lakesho

Precipitation samples collected from July 197 April 1974 at the Indiana Dunes Nati Lakeshore had an average inorganic ion con trations ranging from 0 to 7.0 milligrams per Streams in the National Lakeshore generally h specific conductance ranging from 300 to micromhos, a pH ranging from 6.5 to 8.1, a dissolved oxygen concentration near satura (7.7 to 12.9 milligrams per litre). The bogs marshlands generally contained water wit specific conductance ranging from 40 to micromhos, a pH ranging from 5.0 to 6.5, and solved oxygen ranging from 0.2 to 4.0 milligr per litre. Most surface waters tended to have c um and bicarbonate as the dominant ion pair. ceptions include some inter-dunal ponds and tain watercourses and areas of Pinhook Groundwater chemical quality varied with de and location but not with time during a 6-month terval. Groundwater was usually a calcium nesium bicarbonate type and moderate to hard (71 to 390 milligrams per litre). (Wood USGS)
W76-02147

GROUND-WATER FAVORABILITY AND S FICIAL GEOLOGY OF THE MACHIAS-LUB AREA, WASHINGTON COUNTY, MAINE,
Geological Survey, Augusta, Maine.
For primary bibliographic entry see Field 7C.
W76-02151

LIBRARY U. OF I. URBANA-CHAMPAIGN

RUMENTAL ANALYSIS OF CHEMICAL LUTANTS, TRAINING MANUAL,
ronmental Protection Agency, Cincinnati, . Municipal Permits and Operations Div.
rimary bibliographic entry see Field 5A.
02395

ERMINATION OF DISSOLVED GASES IN ER BY DIFFUSION AND GAS CHRO-OGRAPHIC TECHNIQUES,
least Environmental Research Lab., Athens,

rimary bibliographic entry see Field 5A.
02427

CTIONS OF AQUEOUS ALUMINUM SPE-AT MINERAL SURFACES,
gical Survey, Menlo Park, Calif.
. Brown, and J. D. Hem.
lable from Supt of Documents, GPO, Wash, 20402, price $0.85. Water-Supply Paper 1827-75. 48 p, 22 fig, 11 tab, 12 ref.

riptors: *Chemical reactions, *Aluminum, eous solutions, *Minerology, *Natural rces, Water, Ion exchange, Adsorption, ogen ion concentration, Water chemistry, minerals, Montmorillonite, Kaolinite.
ifiers: *Mineral surfaces, Volcanic ash, Feld-ic sand, Gibbsite.

ous aluminum solutions containing 0.45000 r aluminum in 0.01 molar NaCl04 were partly alized with NaOH to give OH:A1 mole ratios 1.40 to 2.76. Measured amounts of mont-lonite, kaolinite, volcanic ash, or feldspathic vere added to provide an area of inert surface. tions that occurred during 100 days of aging compared with those in similar solutions out added surfaces, studied in earlier work. rption of monomeric species A1(H2O)6, H(H2O)5, and Al(OH)2(H2O)4 on the added ces follows a cation exchange mass law ibrium model, and adsorption is essentially let in 1 hour. Only minor changes in meric aluminum species occurred after that. l adsorption of polynuclear aluminum oxide species also occurs and follows the pat-of the Langmuir adsorption isotherm. In the ce of surfaces, the polynuclear ions slowly ase in size and become microcrystalline ite during aging. Electron micrographs ed microcrystalline gibbsite was present on ces after aging only 2 days. However, the tical data suggest this materials must have adsorbed after it had already attained a near-alline state. Adsorbed polynuclear aluminum oxide species were not extensively converted icrocrystalline gibbsite during 100 days of . (Woodard-USGS)
02485

ER TEMPERATURE-INFLUENTIAL FAC-S, FIELD MEASUREMENT, AND DATA SENTATION,
gical Survey, Reston, Va.
. Stevens, Jr., J. F. Ficke, and G. F. Smoot.
lable from Supt of Documents, GPO, Wash, 20402, price $1.60. Techniques of Water-urces Investigations of the United States gical Survey, Book 1, Chapter D1, 1975. 65 fig, 5 tab, 78 ref.

riptors: *Water temperature, *Data collec-, *Methodology, *Data processing, Water ly, Physical properties, Surface waters, ndwater, Chemical properties, Biological erties, Measurement, *Thermal pollution, tant identification.
ifiers: *Temperature - water quality relation-.

manual contains suggested procedures for cting and reporting of water-temperature data reams, lakes and reservoirs, estuaries, and groundwater. Among the topics discussed are the selection of equipment and measuring sites, objectives and accuracy of measurements, and data processing and presentation. Background information of the influence of temperature on water quality and the factors influencing water temperature are also presented. (Woodard-USGS)
W76-02494

2L. Estuaries

GROWTH OF SALT MARSH MICROCOSMS SUBJECTED TO THERMAL STRESS,
City Univ. of New York. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-02016

ECOLOGICAL BASE-LINE STUDY OF THE FISH OF THE ANCLOTE ANCHORAGE,
University of South Florida, St. Petersburg, Fla.
For primary bibliographic entry see Field 5C.
W76-02019

TOTAL METABOLISM OF THERMALLY AFFECTED COASTAL SYSTEMS ON THE WEST COAST OF FLORIDA,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W76-02021

INFLUENCE OF TEMPERATURE ON THE PHOTOSYNTHETIC EFFICIENCY IN NATURAL POPULATIONS OF MARINE PHYTOPLANKTON,
Massachusetts Univ., Glouchester. Marine Station.
For primary bibliographic entry see Field 5C.
W76-02022

EFFECT OF THERMAL EFFLUENTS ON THE MARINE BIOLOGY OF SOUTHEASTERN FLORIDA,
Miami Univ., Fla. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-02023

STUDIES OF FLORIDA GULF COAST SALT MARSHES RECEIVING THERMAL DISCHARGES,
Florida Univ., Gainesville, Fla. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W76-02024

POTENTIAL USE OF VEGETATION TO ENHANCE COOLING IN HOLDING PONDS,
California State Univ., San Diego. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-02025

THIRD EARTH RESOURCES TECHNOLOGY SATELLITE-1 SYMPOSIUM VOLUME 1: TECHNICAL PRESENTATIONS, SECTION B.
National Aeronautics and Space Administration, Washington, D.C., Scientific and Technical Information Div.
For primary bibliographic entry see Field 7B.
W76-02026

APPLICATIONS OF ERTS DATA TO COASTAL WETLAND ECOLOGY WITH SPECIAL REFERENCE TO PLANT COMMUNITY MAPPING AND TYPING AND IMPACT OF MAN,
American Univ., Washington, D.C., Dept. of Biology.
For primary bibliographic entry see Field 7B.
W76-02036

INVENTORIES OF DELAWARE'S COASTAL VEGETATION AND LAND-USE UTILIZING DIGITAL PROCESSING OF ERTS-1 IMAGERY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 7B.
W76-02037

RELATIONSHIPS BETWEEN ERTS RADIANCES AND GRADIENTS ACROSS OCEANIC FRONTS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
For primary bibliographic entry see Field 7B.
W76-02039

OCEAN INTERNAL WAVES OFF THE NORTH AMERICAN AND AFRICAN COASTS FROM ERTS-1,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
For primary bibliographic entry see Field 7B.
W76-02040

A REVIEW OF INITIAL INVESTIGATIONS TO UTILIZE ERTS-1 DATA IN DETERMINING THE AVAILABILITY AND DISTRIBUTION OF LIVING MARINE RESOURCES,
National Marine Fisheries Service, Bay Saint Louis, Miss. Fisheries Engineering Lab.
For primary bibliographic entry see Field 7B.
W76-02041

UPDATING COASTAL AND NAVIGATIONAL CHARTS USING ERTS-1 DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W76-02042

SEDIMENT CONCENTRATION MAPPING IN TIDAL ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 7B.
W76-02043

MONITORING COASTAL WATER PROPERTIES AND CURRENT CIRCULATION WITH ERTS-1,
Delaware Univ., Newark.
For primary bibliographic entry see Field 7B.
W76-02044

CALIFORNIA COASTAL PROCESSES STUDY,
Corps of Engineers, San Francisco, Calif. South Pacific Div.
For primary bibliographic entry see Field 7B.
W76-02045

THE UTILIZATION OF ERTS-1 DATA FOR THE STUDY OF THE FRENCH ATLANTIC LITTORAL,
Institut Geographique National, Paris (France).
For primary bibliographic entry see Field 7B.
W76-02046

APPLICATIONS OF ERTS-1 IMAGERY TO TERRESTRIAL AND MARINE ENVIRONMENTAL ANALYSES IN ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 7B.
W76-02049

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N. Y.
For primary bibliographic entry see Field 7B.
W76-02050

TIDAL FLATS IN ESTUARINE WATER QUALITY ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-02071

ENVIRONMENTAL STUDIES OF AN ARCTIC ESTUARINE SYSTEM,
Alaska Univ., College. Inst. of Marine Science.
V. Alexander, D. C. Burrell, J. Chang, R. T. Cooney, and C. Coulon.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/3-75-026, June 1975, 536 p. EPA 1BA022. R801124-03.

Descriptors: Aquatic environment, Water emistry, *Bareline studies, *Estuaries, Deltas, *Environmental effects, Currents(Water), Pollutant identification, *Alaska, Oceanography, Artic.
Identifiers: *Colville River(Alas), Beaufort Sea, Hypersaline water.

The Colville River estuarine system was studied over a period of four years. Physical, chemical, geomorphological and biological features were included. North slope river deltas differ significantly from those elsewhere, due to climatological extremes and a long, cold, dart winter with continuous ice-cover and continuous daylight during the summer with melting ice or open water. Basic information has been obtained on the winds, waves and currents. Predominant durrent directions are from the west, with wind drift currents with a periodicity of 4 to 5 days. Beach sediments are characterized as poorly sorted gravelly sandy sediment in a relatively low energy environment. The ice-free biological regime is strongly influenced by the river input of low salinity water containing relatively high concentrations of nitrogen nitrients. An annual primary production in the estuary is estimated at 10-15 g-C/m2. Crustaceans, molluscs and polychaetes characterize the macrofauna at depths exceeding 2m, with but few species responsible for most of the biomass. Interesting features of the chemical regime are connected with the isolation of hypersaline water in the shallow estuarine and river system. Fresh water systems were included in the study. (EPA)
W76-02075

COASTAL ZONE MANAGEMENT PROGRAM APPROVAL REGULATIONS.
National Oceanic and Atmosphere Administration, Rockville.
For primary bibliographic entry see Field 6E.
W76-02101

DISCHARGE AND FLOW DISTRIBUTION, COLUMBIA RIVER ESTUARY,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-02143

CRITICAL THERMAL MAXIMA AND UPPER LETHAL TEMPERATURES FOR THE CALANOID COPEPODS ACARTIA TONSA AND A. CLAUSI,
National Marine Water Quality Lab., West Kingston, R. I.
For primary bibliographic entry see Field 5C.
W76-02329

SOURCES AND SEDIMENT YIELD OF HAWAIIAN WATERSHED AND COASTAL SEDIMENTS,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2J.
W76-02369

APPLICATION OF REMOTE SENSING FOR PREDICTION AND DETECTION OF THERMAL POLLUTION,
Miami Univ., Coral Gables, Fla. Inst. of Clean Energy Research.
For primary bibliographic entry see Field 5A.
W76-02393

MEASUREMENT OF SWASH PROFILE AND ORBITAL MOTION ON THE BEACH,
Tetra Tech, Inc., Pasadena, Calif.
C. J. Sonu, N. Pettigrew, and R. G. Fredericks.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 095, $3.50 in paper copy, $2.25 in microfiche. In: Proceedings of the International Symposium on Ocean Wave Measurement and Analysis, American Society of Civil Engineers, September 9-11, 1974, New Orleans, Louisiana, p 621-638. 10 fig, 7 ref. ONR NR-388-022. ONR N00014-69-A-0211-0003.

Descriptors: *Ocean waves, *Waves(Water), *Measurement, Gaging, Beaches, Seashores, Instrumentation, Equipment, Data processing, On-site investigations, Data collections, Estuaries, Currents(Water), Oceanography.
Identifiers: *Swash profiles, *Orbital motions, Power spectra, Swash currents.

Capacitance wave wires and miniaturized ducted current meters were developed to measure swash profiles and internal velocities directly on the beach face. Both sensors exhibited linear response and were rugged enough to withstand field conditions. Analysis of the data obtained from a linear array of these sensors along a very gentle beach profile was presented. Power spectrum variation in the upbeach direction revealed a low-pass filter effect of the beach along with an enhancement of power density in an infragravity frequency band. The difference between the swash cycle, i.e., the time a single wave takes to complete a return trip on the beach, and the incident wave period explained this latter effect, which may cause a higher wave run-up on a gentle beach than predicted from the incidence wave spectrum alone. (Sims-ISWS)
W76-02394

DEVELOPMENT OF A SHALLOW-WATER WAVE DIRECTION GAGE,
Coastal Engineering Research Center, Fort Belvoir, Va.
R. J. Hallermeier, and W. R. James.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 300, $5.50 in paper copy, $2.25 in microfiche. In: Proceedings of the International Symposium on Ocean Wave Measurement and Analysis, American Society of Civil Engineers, September 9-11, 1974, New Orleans, Louisiana, p 696-712. 2 tab, 47 ref.

Descriptors: *Waves(Water), *Ocean waves, *Shallow water, *Gaging, Instrumentation, Equipment, Measurement, Water level recorders, Water levels, Beaches, Shores, Seashores, Data processing, Estuaries, Oceanography.
Identifiers: *Wave direction measurement, Wave gaging.

The status of an effort to develop a nearshore wave direction gage with a noval principle of operation was reported. This point direction gage uses a thin pile in fairly shallow water to nonlinearly, but regularly, transform each steep incident crest, momentarily forming a bow wave. A few water level gages deployed around the
sense the bilaterally symmetric transforma
and then the symmetry direction of a data set
the gages is electronically estimated. Prelim
laboratory tests have indicated direction mea
ments of high precision may be made from
data on peak water level at a pile. Details of th
visioned instrument's operation were discu
There is a variation in peak water level at th
on the order of the incident crest velocity
and the accuracy and resolution of the water
gages in sensing this variation seem to plac
most important limitations on the instrum
usefulness. The direction of only rather ene
crests can be measured. Some specific design
ices were given for a simple instrument that
useful in typical Great Lakes wave action, ac
ing to available data. The remaining develop
work was indicated; planned efforts will est
the capabilities of this type of instrument. (
ISWS)
W76-02399

**RESULTS FROM THE CERC WAVE
SUREMENT PROGRAM,**
Coastal Engineering Research Center,
Belvoir, Va.
E. F. Thompson.
Available from the National Technical Inf
tion Service, Springfield, Va 22161 as AD-
114, $3.50 in paper copy, $2.25 in microfich
Proceedings of the International Symposiu
Ocean Wave Measurement and Analysis,
ican Society of Civil Engineers, September
1974, New Orleans, Louisiana, p 836-855.
10 ref.

Descriptors: *Waves(Water), *Ocean
*Gaging, Measurement, On-site investiga
Data collections, Beaches, Seashores, S
Data processing, Energy, Analytical techni
Estuaries, Oceanography.
Identifiers: *Wave energy spectra, Wave he
Spectral shapes.

Since 1972 the Coastal Engineering Res
Center (CERC) has routinely analyzed
wave records from operative Atlantic, Gul
Pacific coast wave gage locations. For coast
gineers, a very useful result from the digital
sis of wave records is significant wave heig
wave period corresponding to the highest d
of spectral energy. Another potentially
result is the wave energy spectrum which is
puted with a Fast Fourier Transform algo
The CERC methods of collecting, analyzing
summarizing digital wave records were disc
Results from the analysis of digital wave re
at CERC were summarized by month as s
cant heights and periods. A variety of sp
shapes was found. Often spectral energy w
vided among two or three distinct peaks.
peaks were generally interpreted as an indi
of the presence of a local sea and one or
trains of swell from distant storms. For t
more gages operating within 51 meters of
other, spectral shapes and total energy c
were generally similar; but the relative mag
of the different spectral peaks could
noticeably between gages. Thus, the signi
wave period, chosen as the highest peak
spectrum, could differ considerably be
gages. Aerial photographs of wave condition
the coast and wave refraction theory provid
sight into the spatial variation of waves.
ISWS)
W76-02400

**HORIZONTAL TURBULENT EN
TRANSFER ASSOCIATED WITH A G
LAKES COASTAL CURRENT,**
Wisconsin Univ., Madison. Marine S
Center.
For primary bibliographic entry see Field 2H
W76-02411

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ROLE OF TIDAL MIXING IN RUPERT HOLBERG INLETS, VANCOUVER ND,
sh Columbia Univ., Vancouver. Inst. of nography.
. Drinkwater, and T. R. Osborn.
nology and Oceanography, Vol 20, No 4, p 529, July 1975. 15 fig, 2 tab, 11 ref.

criptors: *Temperature, *Salinity, *Dissolved gen, *Mixing, Solar radiation, Precipita- Atmospheric), Runoff, Tidal waters, Tidal ef- s, Monthly, *Canada, Oceanography, Estua- Hydrology, Water quality, Tides, ets(Waterways), Inflow.
tifiers: *Vertical mixing, Biological in- nces, British Columbia(Canada).

lysis of monthly observations of temperature, ity and dissolved oxygen content in the basin ied by Rupert and Holberg Inlets revealed ter vertical mixing than most British Columbia s. The water temperature correlated with solar ation while the salinity changes followed river off, in turn controlled by precipitation. The ation in dissolved oxygen appeared due to a bination of biological influences and the influx vater. A model was developed which ascribes monthly fluctuations and vertical homogeneity n accumulation of irregular mixing events as- ated with the tidal flow through Quatsino Nar- s, a shallow connecting channel. (Lee-ISWS) 5-02413

RTICAL PATTERNS OF EDDY DIFFUSION RING STRATIFICATION IN CASTLE LAKE, LIFORNIA,
fornia Univ., Davis. Div. of Environmental dies; and California Univ., Davis. Inst. of logy.
primary bibliographic entry see Field 2H. 5-02414

ASUREMENT OF THE APPARENT PH OF WATER WITH A COMBINATION CROELECTRODE,
val Undersea Center, San Diego, Calif. Div. of emistry and Environmental Sciences.
Zirino.
nology and Oceanography, Vol 20, No 4, p 657, July 1975, 3 fig, 6 ref. ONR NR 083-301.

scriptors: *Hydrogen ion concentration, *Sea er, *Measurement, *Instrumentation, ectrodes, Chemical properties, Water chemis- Properties, Oceans, Testing procedures, Ions, alytical techniques, Pacific Ocean, Tempera- e, Carbon dioxide, Chemistry, On-site tests, ter properties.
ntifiers: Combination microelectrode, parent pH, *pH meters, Orion model 801, Cell ential, Reference junction, Seawater samples.

ethod for precisely measuring the apparent pH eawater, using a microelectrode and a specially igned cell, was described. The cell required a ml sample, reached equilibrium in 6 min or less, its precision in routine use at sea was + or - 026 pH units. (Henley-ISWS) 6-02415

NUMERICAL MODEL OF MATERIAL ANSPORT IN SALT-WEDGE ESTUARIES, RT 1. DESCRIPTION OF THE MODEL,
ological Survey, Menlo, Park, Calif.
B. Fischer.
ailable from Supt. of Documents, GPO, Wash, , 20402, price $1.25. Professional Paper 917, p , 1975. 5 fig, 10 ref.

scriptors: *Saline water, *Flow, *Estuaries, mputer models, *Computer programs, stems analysis, Methodology, Movement, Dis- ved solids, Model studies, Numerical analysis, atification, Path of pollutants.
ntifiers: *Salt-wedge movement.

Water in a salt-wedge estuary ideally is characterized by an oscillating well-mixed wedge of undiluted seawater topped by a series of successively more dilute overlying layers. In the wedge the flow is back and forth, with a net landward component to replace water entrained upward into the overlying layer; in the overlying layers the flow also oscillates, but with a net seaward component because of the input of fresh river water and entrained wedge water. The flow is modeled by a computer program, and the flow is used as an input to the constituent-transport model. The computer program then is used to determine the advection and dispersion of dissolved constituents and plankton, and their concentrations throughout the system in response to given inputs. The report describes required input data and method of operation of the computer program. (Woodard-USGS)
W76-02481

A NUMERICAL MODEL OF MATERIAL TRANSPORT IN SALT-WEDGE ESTUARIES, PART II. MODEL COMPUTATION OF SALINITY AND SALT-WEDGE DISSOLVED OXYGEN IN THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
J. D. Stoner, W. L. Haushild, and J. McConnell.
Available from Supt of Documents, GPO, Wash, DC, 20402, price $1.25. Geological Survey Professional Paper 917, p 13-36, 1975. 17 fig, 3 tab, 12 ref.

Descriptors: *Salinity, *Saline water, *Dissolved oxygen, Movement, *Estuaries, *Computer models, Washington, Systems analysis, Forecasting, Flow, Sewage effluents, Tracking techniques, Model studies, Tidal effects, Runoff, Path of pollutants.
Identifiers: *Salt-wedge movement, *Duwamish River estuary(Wash).

Saltwater from Elliot Bay on Puget Sound forms a wedge in the lower part of the Duwamish River estuary in Washington. The numerical model described by Fischer in Part I of this report was used in computing salinity distributions in the estuary, and oxygen-use rates and dissolved-oxygen distributions in the salt wedge. Computed spatial distributions of salinity agreed well with observed distributions during about 30 slack tides in July and August 1968. Analyses of the sensitivity of computed salinity to changes in model input parameters indicate that salinity changed most in response to changes in the wedge salinity and the location of the wedge toe. The model was used to predict the changes that would have occurred in the oxygen-use rate and DO concentrations in the wedge during June-September 1971 if discharge of Renton Treatment Plant effluent had been increased from a 1971 average of 37 cfs to the planned maximum of 223 cfs. The predictions suggest that (1) the oxygen-use rate would have been increased by 92 percent, (2) a relatively low DO concentration (4 mg/litre) would have been decreased by 45 percent, and (3) a relatively high concentration (9 mg/litre) would have been decreased by 8 percent. (Woodard-USGS)
W76-02482

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

TWO CITIES TEST REVERSE OSMOSIS SYSTEM.
For primary bibliographic entry see Field 5D.
W76-02217

ECONOMIC ALTERNATIVES IN SOLVING THE U.S.-MEXICO COLORADO RIVER WATER SALINITY PROBLEM,
Arizona Agricultural Experiment Station, Tucson.
W. E. Martin.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 64-77. 1 tab, 14 ref, 2 append.

Descriptors: *Desalination, *Salinity, *Alternative planning, *Cost comparisons, *Colorado River, *Irrigation water, Alternative water use, Water utilization, Water management(Applied), Cost analysis, Water rates, Project planning, Alternative costs, Saline water, Desalination plants, Mexico, Water quality, Water pollution sources, Water reuse, Drainage water, Irrigation programs, Water policy.

A proposed desalting plant is an engineering solution to the effects of a problem which could have been avoided and even now could be reduced on the farm. Water costing $125 per acre-foot will be delivered to Mexico to grow wheat, cotton, garden crops, alfalfa and safflower, of which the average value added per acre-foot was estimated at $80 for cotton and garden crops and $14 for wheat, alfalfa and safflower. The U.S. government, instead of building the desalting complex, could accomplish its purpose just as well by paying each farmer in the Yuma area, in return for the farmers reducing their drainage flow by whatever method they see fit, $114 per acre per year for the next 50 years. With proper management on the farm, the costs of managing salinity need not be high. (Robinett-Arizona)
W76-02226

SALINITY CONTROL PLANNING IN THE COLORADO RIVER SYSTEM,
Bureau of Reclamation, Denver, Colo. Water Quality Office.
J. T. Maletic.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974 Flagstaff, Arizona, p 108-126, 3 fig, 3 tab, 8 ref.

Descriptors: *Colorado River, *Desalination, *Planning, *Mexico, *Water management(Applied), Salinity, Alternative planning, Water utilization, Project planning, Saline water, Desalination plants, Water quality, Water reuse, Irrigation water, Drainage water, Costs, Water sources, Water policy, Irrigation programs.
Identifiers: Salinity control, Colorado River Water Quality Improvement Program, Colorado River International Salinity Control Project.

In the lower reaches of the Colorado River, damages from the increase in salinity to U.S. water users are now estimated to be about 53 million dollars per year and will increase to about 124 million dollars per year by the year 2000 if no salinity control measures are taken. Physical, legal, economic, and institutional aspects of the salinity problem and proposed actions to mesh alinity control with a total water management plan for the Basin are discussed. A scheme is presented for planning under the Colorado River Water Quality Improvement Program. Recent legislative action is also discussed which provides control plans to improve the water quality delivered to Mexico as well as Upper Basin water users. These efforts now under study will assure the continued, full utility of Colorado River water to U.S. users and Mexico. However, more extensive development of the Basin's natural resources puts new emphasis on total resources management through improved water and land use planning to conserve a most

precious western resource - water. (Robinett-Arizona)
W76-02230

FRESH WATER FOR ARIZONA BY SALT REPLACEMENT DESALINATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. B. Muller.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 127-136. 2 fig, 10 ref.

Descriptors: *Desalination, *Water chemistry, *Desalination processes, *Membrane processes, *Reverse osmosis, Water treatment, Water purification, Desalination plants, Costs, Saline water, Water supply, *Arizona, Cost comparisons, Solvent extractions, Water yield.
Identifiers: *Salt replacement desalination, Replacer chemical, Ultrafiltration, High flux membranes, Energy requirements, Fixed gel syneresis.

The process of salt replacement desalination proposed is believed to be able to produce vast quantities of fresh water be desalination. This method, which is a novel approach to minimizing the costs of saline water conversion, consists of the substitution of solutes in a solution to be desalted by a replacer chemical, and the low energy removal of that replacer chemical. The ultrafiltration of larger molecular sized replacer chemicals with high flux membranes increases the produce yield rate and reduces the corresponding energy requirement, with respect to reverse osmosis. In addition, the initial captial investment is less since no pressure constraining devices are required. The alteration of the osmotic pressure of the replacer solution within the process can also take advantage of energy savings through the utilization of an easily reversible reaction which synthesizes and breaks down a constituent that has a significant osmotic pressure difference between phases. Finally, the unusual process of fixed gel syneresis shows potential as a low energy salt replacement type process, but still requires extensive investigation. (Robinett-Arizona)
W76-02231

TWIN BELT ION EXCHANGE SYSTEM,
For primary bibliographic entry see Field 5F.
W76-02254

APPARATUS FOR AND A METHOD OF PURIFYING WASTE FLUID,
United States Steel Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-02262

CLEANING OF MEMBRANE SURFACES,
Universal Oil Products Co., Des Plaines, Ill. (Assignee).
J. L. Jennings.
U.S. Patent No 3,912,624, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 939, No 2, p 931, October 14, 1975.

Descriptors: *Patents, *Membranes, *Reverse osmosis, Water quality control, Water pollution control, Separation techniques, Industrial wastes, Cleaning, *Desalination, Waste water treatment.
Identifiers: Water droplets, High velocity air flow.

The invention provides an improved rapid method for cleaning the membrane surfaces of a membrane separation unit after being in use, which comprises the steps of: partially filling the fluid passageways with water and then purging with air at a superatmospheric pressure to cause water droplets to move at high speed over the membrane surfaces and remove accumulated materials; and repeating the operation of the preceding step to effect a substantial removal of all accumulated materials and substanially all water droplets from the membrane surfaces without permitting any drying of the membrane. In connection with reverse osmosis systems, it may be advisable to initially effect a removal of pressure through the system and permit an osmotic back-flush through the membranes in order to provide an initial lifting or loosening of accumulated material. After permitting the back-flush procedure, then there may be the repeated purgings of fluid passageways and membrane surfaces with high speed air and entrained water droplets. Only a few minutes of operation will be needed for each purging stage and in many instances the entire cleaning procedure may be completed in approximately 10 minutes. (Sinha-OEIS)
W76-02263

3B. Water Yield Improvement

WATER RESOURCES RESEARCH ON FOREST AND RANGELANDS IN ARIZONA,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4A.
W76-02220

LABORATORY EVALUATION OF WATER-REPELLENT SOILS FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. H. Fink.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona. p 55-63, 4 tab, 7 ref.

Descriptors: *Soil surfaces, *Water harvesting, *Water yield improvement, *Materials testing, Arid climates, Rainfall-runoff relationships, Water yield, Runoff, Rainfall, Soil types, Laboratory tests.
Identifiers: *Water repellent soils, Paraffin wax, Dust suppressant.

Reported are laboratory evaluations to screen water-repellent materials and treatments before testing them in the field. Water repellency tests were conducted on paraffin wax, a wax emulsion and silicon, lard, and a liquid dust suppressant. Six water repellency tests showed that the high rates of paraffin wax and all rates of the dust suppressant produced highly water-repellent soil surfaces. The six water repellency tests were: (1) the aqueous-alcohol drop test for determination of the 90 degree surface tension for a porous solid, (2) the water drop penetration time test, (3) the relative height of a large sessile water drop resting on the smoothed, treated soil surface, (4) and (5) the presence and persistence of air bubbles trapped between the soil-water interface, and test (6) was made to note whether the large sessile water drop from test (3) would infiltrate the soil or evaporate. Tests (3), (4), and (5) proved the most useful of the six methods for measuring water repellency. Soil type had no significant influence on degree of water repellency as measured in the laboratory by these six tests. (Robinett-Arizona)
W76-02225

ENGINEERING AND ECOLOGICAL EVALUATION OF ANTITRANSPIRANTS FOR INCREASING RUNOFF IN COLORADO WATERSHEDS,
Colorado Univ., Boulder. Dept. of Chemical Engineering.
Jay E. Anderson, and Frank Kreith.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as PB 248 $4 00 in paper copy, $2 25 in microfiche Color Environmental Resources Center, Fort Col Completion Report Series No 69, September 1 37 p, 12 fig, 7 tab, 13 ref

Descriptors: *Antitranspirants, Water consu tion, Colorado, New Mexico, Evaluation, Run *Phreatophytes, Evapotrans *Evapotranspiration control, Thin films, *W yield improvement, *Watershed management. Identifiers: Bernardo(N Mex), *Salt cedar.

Experiments were performed in the laboratory in the field to determine the effectiveness of 3 ferent types of film forming antitranspirant reducing the evapotranspiration f phreatophytes, with special emphasis on cedar. The antitranspiranats tested were M Leaf (Mobil Chemical Co.), wilt proof (Nur Specialty Products) and XEF-4-3561 (Dow C ing Corp.). The laboratory experiments indic that a single antitranspirant treatment can re the water loss from salt cedar by as much as for several days and that the long term ef tivenss of Mobil-Leaf is significantly better that of the other two antitranspirants. None o plants treated with Mobil-Leaf showed discoloration or other physiological injury wit month after treatment. Field studies with Mo Leaf were conducted in cooperation with the reau of Land Management at the E Evapotranspirometer Installation of Berna New Mexico. The decrease in evapotranspira from salt cedar observed in the field was less that in the laboratory and current indications that the resulting water savings was prob somewhat less than 30%. It is possible that the ference between laboratory and field effects is to a lack of uniformity and thoroughness of spray covering.
W76-02368

APPROXIMATION FORMULAS FOR EQUILIBRIUM SIZE OF AN AERSOL PA CLE AS A FUNCTION OF ITS DRY SIZE COMPOSITION AND THE AMBIENT RE TIVE HUMIDITY,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 2B.
W76-02421

TIME-INTEGRATED RADAR ECHO TOPS MEASURE OF CLOUD SEEDING EFFECTS,
Research Council of Alberta, Edmonton. mospheric Science Div.
G. G. Goyer.
Journal of Applied Meteorology, Vol 14, No 1362-1365, October 1975. 5 fig, 6 ref.

Descriptors: *Cloud seeding, *Radar, *Wea modification, Measurement, Clouds, Hail, T derstorms, Rainfall, Silver iodide, Cloud phy Remote sensing, Meteorology.
Identifiers: *Cloud growth, Radar echo t Seeding rates.

Radar echo tops of individual cells, integr over their duration above 7.6 km, were use define an overall storm magnitude, a growth fa after seeding, and an average seeding rate. growth factor was then plotted as a function o average seeding rate for 23 seeded cells and 23 domly selected non-seeded cells. The re showed an appreciable decrease not only in range of growth factors but also in the ave growth factor as the average seeding rate creased. Time-integrated values of other r measures, such as reflectivity and echo cover that can be better related to precipitation inter than echo tops, were suggested as more accu and sensitive measures of the effects of c seeding on the radar characteristics of convec storms. (Sims-ISWS)
W76-02424

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Use Of Water Of Impaired Quality

IUM RELATIONS IN DESERT PLANTS: 3. ION-ANION RELATIONSHIPS IN THREE CIES WHICH ACCUMULATE HIGH ELS OF CATIONS IN LEAVES,
ornia Univ., Los Angeles. Lab. of Nuclear icine and Radiation Biology.
Vallace, E. M. Romney, J. W. Cha, and G. V. ander.
Science, Vol 118, No 6, p 397-401, December, 4 tab, 11 ref.

riptors: *Plant physiology, *Cation adsorp- *Anion adsorption, *Desert plants, *Sodium ounds, Arid lands, Plant growth, Plant tis- Leaves, Ions, Cations, Anions, Sodium ide, Organic acids, Bicarbonates, Semiarid ates.
tifiers: *Lysium andersonii Gray, *Atriplex ertifolia(Torr. and Frem.) Wats., *Atriplex enelytra (Torr.) Wats., Sodium nitrate, Ca- anion balance, Mojave desert.

e desert perennial plant species from the ave Desert (Lycium andersonii Gray, Atriplex ertifolia (Torr. and Frem.) Wats., and An- ex hymenelytra (Torr.) Wats. were grown and rimentation conducted in order to evaluate effects of different sources of Na (NO3-, Cl-, O4-) upon cation-anion balance in the plants. content of each anion was increased with minor, if any, interactions with other anions. measured milliequivalent sum of anions in- sed in each plant part and there were usually est increases in the milliequivalent sum of ca- . In nearly all cases with the 3 species, the ca- sum greatly exceeded the anion sum indicat- large amount of organic acids in the leaves the presence of bicarbonate. In this study, in h all plants were grown with the same soil, L. rsonii accumulated much larger concentra- of Li than did the other two species. (See also -12793 and W73-12792) (Robinett-Arizona) -02158

SUITABILITY INDEX OF DRAINAGE TERS FOR IRRIGATION PURPOSES,
Shams Univ., Cairo (Egypt). Dept. of Soils.
V. A. Hamid, and H. Hamdi.
ptian Journal of Soil Science, Vol 14, No 1, p 114, 1974, 3 tab, 10 ref.

criptors: *Irrigation water, *Salinity, *Return , *Plant physiology, *Saline water, Water e, Irrigated land, Irrigation, Irrigation prac- , Water demand, Water sources, Water zation, Irrigation effects, Crop response, nage effects, Plant growth, Soil chemical pro- es, Arid lands, Soil-water-plant relationships, e soils, Water quality.
tifiers: *Egypt, *Suitability index.

cultural expansion in Egypt depends largely water, which is a limited resource. Large unts of drainage water as well as ground water aining different quantities of salts are not erly utilized in Egypt. This study attempts to a suitability index of the main drain waters for ation purposes using soil texture, drainage r properties, and plant salt tolerance as rating xes for classification of saline irrigation water. er samples analyzed for different drains in pt show that about 33 percent of the waters r consideration have a suitability index veen 10.1 and 11.5, with the mean calculated to 1.5. The minimum suitability, therefore, which t be considered safe without including plant rance ratings is 10. The sums of both the suita- y index of 10 plus plant tolerance ratings will 1, 12 and 13, which means that irrigation water fe for sensitive plants below an index of 11, tolerant plants less than 12, and safe for all ts if the index is less than 13. (Robinett- ona)

W76-02168

UNITED STATES-MEXICO WATER AGREEMENTS AND RELATED WATER USE IN MEXICALI VALLEY: A SUMMARY,
Arizona Water Resources Research Center, Tucson.
K. J. DeCook.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrolgoy Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 78-93. 2 fig, 27 ref.

Descriptors: *Colorado River, *Desalination, *Mexico, *Salinity, *Planning, Mexican Water Treaty, Colorado River Compact, Alternative planning, Water utilization, Water management(Applied), Saline water, Water quality, Water pollution sources, Drainage water, Irrigation water.
Identifiers: *Mexicali Valley(Mex), Water agreements.

A summary is given of interrelated, technical and institutional events concerning the Colorado River which took place between the United States and Mexico from 1849 to 1974 with emphasis on the 1961-1974 period. Until the treaty of 1944, Mexico had had no guarantee of a specific annual quantity of water, but in the years after 1945, when a guarantee of 1.5 million acre-feet per year was established, more than that amount was available for use. Salinity problems arose, and in 1965 an agreement for a 5-year plan for alleviating the technical and political difficulties surrounding the salinity question was made. In 1973 it was agreed that the United States would build, within approximately 5 years, a facility for desalting the saline drainage water entering Mexico. Fulfillment of the technical provisions for this Agreement requires, in any event, the timely provision of federal funds to construct and operate the physical works. The several states should receive assurance that their rights and those of their respective water users will not be impaired within the legal operation of the Agreement. (Robinett-Arizona)
W76-02227

SALINITY CONTROL PLANNING IN THE COLORADO RIVER SYSTEM,
Bureau of Reclamation, Denver, Colo. Water Quality Office.
For primary bibliographic entry see Field 3A.
W76-02230

RECLAMATION BY TUBEWELL DRAINAGE IN RECHNA DOAB AND ADJACENT AREAS, PUNJAB REGION, PAKISTAN,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 4B.
W76-02484

3D. Conservation In Domestic and Municipal Use

REMOTE SENSING AS AN AID TO COMMUNITY DEVELOPMENT IN AN ARID AREA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7B.
W76-02165

MUNICIPAL WASTEWATER REUSE IN THE U.S.,
SCS Engineers, Long Beach, Calif.
For primary bibliographic entry see Field 5D.
W76-02189

METROPOLITAN OPERATED DISTRICT FOR SEWAGE EFFLUENT-IRRIGATION WATER EXCHANGE,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5D.
W76-02228

A RATIONAL WATER POLICY FOR DESERT CITITES,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. G. Matlock.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 99-107. 2 fig, 1 tab, 6 ref.

Descriptors: *Arid lands, *Water shortage, *Water supply, *Water policy, *Water conservation, *Regulation, Water resources, Governments, Planning, Water allocation(Policy), Water utilization, Rainfall, Runoff, Groundwater, Water wells, Groundwater recharge, Groundwater availability, Imported water, Water demand, Water rates, Urban runoff, Arizona.
Identifiers: Desert cities, Tucson(Ariz).

Four sources of water supply for desert cities are rainfall, runoff, groundwater, and imported water, and the potential use for each varies. The government can institute various policy changes to eliminate or reduce the imbalance between water supply and demand. Restrictions should be placed on water-use luxuries such as swimming pools, subdivision lakes, fountains, etc. Water pricing should be progressive; each unit of increased use above a reasonable minimum should be charged for at an increasing rate. Runoff from individual properties, homes, storage, and supermarkets should be minimized through the use of onsite recharge wells, and various collection methods should be initiated. A campaign to acquaint the general public with a new water policy must be inaugurated. (Robinett-Arizona)
W76-02229

HYDROLOGIC ASPECTS OF LAND-USE PLANNING AT TUMAMOC HILL, TUCSON, ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 4A.
W76-02245

3E. Conservation In Industry

ELECTROLYTIC TREATMENT OF JOB SHOP METAL FINISHING WASTEWATER,
New England Plating Co., Inc., Worcester, Mass.
For primary bibliographic entry see Field 5D.
W76-02070

PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-02104

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN SOUTHERN MISSISSIPPI--1974,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W76-02148

WATER RESOURCE ALTERNATIVES FOR POWER GENERATION IN ARIZONA,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
S. E. Smith, K. J. DeCook, and R. A. Fazzolare.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 289-299, 3 fig, 3 tab, 10 ref.

Descriptors: *Water reuse, *Water conservation, *Electric power production, *Nuclear powerplants, *Cooling water, *Water sources, Water resources, Water management(Applied), Water supply, Water utilization, Water requirements, Hydroelectric power, Electric power, Efficiencies, Electric power demand, Industrial water, *Arizona, Potential water supply.

An examination of potential water sources for power plant cooling in Arizona is presented along with information pertinent to Arizona's future water needs relative to electrical usage growth. It has been projected that Arizona's peak electrical power demands in 1980 and 1990 will exceed that of 1970 by some 5000 megawatts and 16000 megawatts of electricity respectively. At present, the bulk of the electrical energy generated in the western states originates at hydroelectric installations. Utilization of nuclear reactors for power generation requires a larger amount of cooling water than is required for a comparable fossil-fueled plant. It is suggested that the utilization of reclaimed wastewater for cooling purposes is a viable and attractive alternative to groundwater pumpage from both economic and ecological standpoints. Savings arise from conservation of fuel normally required for well pumps, costs of well construction are not required, quantities of fresh water should be released for consumption by alternate users, and a previously unused resource would be effectively recycled. (Robinett-Arizona)
W76-02243

GEOTHERMAL ENERGY SYSTEM AND CONTROL APPARATUS,
Sperry Rand Corp., New York. (assignee).
For primary bibliographic entry see Field 4B.
W76-02247

SLIME INHIBITOR FOR USE IN INDUSTRIAL WATER RECIRCULATING SYSTEMS,
For primary bibliographic entry see Field 5D.
W76-02253

EFFICIENT AND NONPOLLUTING METHOD FOR RECOVERING GEOTHERMAL HEAT ENERGY,
For primary bibliographic entry see Field 4B.
W76-02255

ANAEROBIC DIGESTION OF DAIRY FARM SLURRY,
Surrey Univ., Guilford (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5D.
W76-02292

TREATS HUGE FLOWRATES,
For primary bibliographic entry see Field 5D.
W76-02293

WASTEWATER TREATMENT AT FORD'S WINDSOR COMPLEX,
Ford-Windsor Complex (Ontario).
For primary bibliographic entry see Field 5D.
W76-02298

CONTINUOUS PRINTED CIRCUIT ETCHING-WITHOUT POLLUTION,
Pennwalt Corp., Warminster, Pa. Sharples-Stokes Div.
For primary bibliographic entry see Field 5D.
W76-02299

FLUIDIZED-METAL TRAPS METAL.
For primary bibliographic entry see Field 5D.
W76-02300

PROCESS WATER REUSE AND CONTROL AT AN NSSC MILL,
Green Bay Packaging, Inc., Wis.
For primary bibliographic entry see Field 5D.
W76-02302

POLLUTION FREE MILLS: FACTS AND VISIONS,
Lekanders Ingenjoersbyra A.B. Alingas (Sweden).
For primary bibliographic entry see Field 5D.
W76-02303

STABILIZING THE PURIFIED WATERS GENERATED BY THE ETCHING SHOPS FOR THEIR UTILIZATION IN THE REVERSE CYCLE (STABILIZATSIYA OCHISHCHENNYKH PROMYVNYKH VOD TRAVIL'NYKH OTDELENIY DLYA ISPOL'ZOVANIYA V OBOROTNOM TSIKLE),
For primary bibliographic entry see Field 5D.
W76-02304

COAL FINES RECOVERED FROM WATER BY FROTH-FLOTATION.
For primary bibliographic entry see Field 5D.
W76-02307

PEACHES DRY-PEELED AT DEL MONTE.
For primary bibliographic entry see Field 5D.
W76-02308

COMPLETE REUSE OF TEXTILE DYEING WASTES PROCESSED WITH DYNAMIC MEMBRANE HYPERFILTRATION,
Clemson Univ., S.C. Dept. of Textile.
For primary bibliographic entry see Field 5D.
W76-02312

MASSIVE LIME TREATMENT COLOR REMOVAL FROM KRAFT EFFLUENTS,
International Paper Co., Mobile, Ala.
For primary bibliographic entry see Field 5D.
W76-02314

KRAFT PULP AND PAPER MILL POLLUTION ABATEMENT, MODERINIZATION, AND EXPANSION.
For primary bibliographic entry see Field 5D.
W76-02338

WASTE WATER COOLANT.
For primary bibliographic entry see Field 5D.
W76-02340

METAL PLATER RECOVERS TOXIC IONS.
For primary bibliographic entry see Field 5D.
W76-02352

PROCESS WATER REUSE AND UPSET CONTROL MODIFICATION AT AN INTEGRATED NSSC MILL,
Green Bay Packaging, Inc. Wis. Mill Div.
For primary bibliographic entry see Field 5D.
W76-02356

RECOVERY PLANT RECYCLES OIL WAS
For primary bibliographic entry see Field 5D.
W76-02358

PACKING PICKLES WITH RECYCLED BR
For primary bibliographic entry see Field 5D.
W76-02360

SOME TRENDS IN INDUSTRIAL WATER WASTES MANAGEMENT,
Consultancy Services Ltd. (England) Env mental Control.
For primary bibliographic entry see Field 5D.
W76-02429

UHR FILTERS TREATING MILL WA WATERS,
De Laval Turbine, Inc., Florence, N.J. Cond and Filter Div
For primary bibliographic entry see Field 5D.
W76-02434

SOUR WATER STRIPPER: ITS DESIGN APPLICATION,
Atlantic Richfield Co., Houston, Tex.
For primary bibliographic entry see Field 5D.
W76-02436

THE LAMELLA SEPARATOR: A DEFINI AND RESULT OF PILOT STUDIES IN PULP AND PAPER AND STEEL INDUSTRI
Axel Johnson Institutet for Industriforsk Nynashamn (Sweden).
For primary bibliographic entry see Field 5D.
W76-02437

WASTEWATER REUSE AND IN-PI TREATMENT,
Ashland Oil and Refining Co., Ky.
For primary bibliographic entry see Field 5D.
W76-02448

WATER RECYCLING SYSTEMS AT M PROCESSING WASTE PAPER (SIST OBOROTNOGO VODOPOTREBLENIYA PREDPRIYATIYAKH, PERERABATYVAYUSHCHIKH MAKUL RU),
Ukrainskii Nauchno-Issledovatelskii Institu magi, Kiev (USSR).
V. P. Svitel'skii, and S. T. Litvinova.
Bumazhnaya Promyshelnnost, No 6, p 25-26 1975. 1 fig, 3 tab.

Descriptors: *Water reuse, *Waste water ment, Reclaimed water, Water pollution ment, Water pollution control, Water pol sources, Industrial wastes, Wastes, Alum Sulfates, Screens, Water purification, Susp solids, Biochemical oxygen demand, Wate sumption(except consumptive use), Water tion, Water conservation, Pulp wastes, water, Industrial water, Pulp and paper ind Filtration, Chemical precipitation, Coagulati Identifiers: *Paper mills, *Board mills, * paper, OV-02 fractionator, Fiber rec Polyacrylamide, Aluminum sulfate, water(Paper machine), Showers(Paper mac Soviet Union(USSR).

A study of water reuse at paper and board processing waste paper, conducted by the Uk an Research Institute of the Pulp and Paper I try, showed that water reuse averages 70% some mills even 85%. The consumption of water ranges from 34 to 80 cu m/ton. The ef purification equipment, which is satisfacto mills processing pulpwood, is frequentl adequate for effluents from waste processing, because of the high content of dispersed solids, the presence of colloids, a

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ɔpment of microorganisms. This study in-
d that the most effective separation of fibers
omplished on OV-02 fractionators. These
ɔnators selectively remove 92-94% of fibers
than 1 mm, which can then be reused. The
that passes the screen contains no coarse
les and can be partially recycled, e.g., for
rs. The excess must be purified chemically.
urification system consists of separating the
le fibers on the OV-02 fractionator and
ent of the effluent with aluminum sulfate
olyacrylamide, followed by dewatering of
diment by centrifugation. The degree of pu-
ion is 92-94% with respect to suspended
60-80% with respect to oxidizability, and
% with respect to 5-day BOD. This system
educe the freshwater consumption to 20-24
ton, reduce the pollution load by 15%, and
the reuse of over 75% of the purified water.
nski-IPC)
2465

ORMANCE HISTORIES OF BOILER WATER PLANTS HIGHLIGHT THE AD-TAGES OF REVERSE OSMOSIS,
ne Corp., Union, N. J.
imary bibliographic entry see Field 5D.
2473

ER REUSE AT PONDEROSA PAPER DUCTS, INC., FLAGSTAFF, ARIZONA,
rosa Paper Products, Inc., Flagstaff, Ariz.
imary bibliographic entry see Field 5D.
2474

Conservation In Agriculture

OTE-SENSING TECHNIQUES FOR RMINING WATER TABLE DEPTHS IN GATED AGRICULTURE,
imary bibliographic entry see Field 7B.
2160

UITABILITY INDEX OF DRAINAGE ERS FOR IRRIGATION PURPOSES,
ams Univ., Cairo (Egypt). Dept. of Soils.
imary bibliographic entry see Field 3C.
2168

EASING FORAGE PRODUCTION ON A ARID RANGELAND WATERSHED,
ltural Research Service, Tucson, Ariz.
west Watershed Research Center.
imary bibliographic entry see Field 4A.
2223

ROPOLITAN OPERATED DISTRICT FOR AGE EFFLUENT-IRRIGATION WATER IANGE,
na Water Resources Research Center, Tuc-

imary bibliographic entry see Field 5D.
2228

GATION CANAL, WATER-WITHDRAWAL
Whitlock.
Patent No 3,910,052, 2 p, 6 fig, 4 ref; Official
te of the United States Patent Office, Vol
o 1, p 81, October 7, 1975.

iptors: *Patents, *Irrigation practices,
ation systems, *Flood irrigation, *Irrigation
ncy, *Irrigation canals, *Weirs, Concrete
ures, Water distribution(Applied), Remote
ol.

ithdraw water from an irrigation canal or
litch for distribution to a number of field cor-
ons, a weir is installed in the canal to contain a bifurcated water check or dam pointed downstream of the water flow in the canal. The bifurcated water check or dam forms an upstream pool of water to be withdrawn and distributed to the corrugations. The weir includes a valved outlet adjacent the upstream portion of the bifurcated dam, and outflowing water from the pool is conducted to a distributor conduit extending generally parallel alongside the canal at the head ends of the corrugations. The conduit includes a tube for each corrugation to conduct water from within the conduit to the corrugations. (Sinha-OEIS)
W76-02248

DRIP IRRIGATION SYSTEM AND COMPONENTS THEREOF,
Xeros Controls, Azusa, Calif. (Assignee).
A. P. Hardison.
U.S. Patent No 3,910,500, 7 p, 12 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 939, No 1, p 230, October 7, 1975.

Descriptors: *Patent, *Irrigation systems, *Surface irrigation, *Irrigation practices, Irrigation efficiency, Filters, Filtration.
Identifiers: *Drip irrigation, Sand filters, Backwash.

A drip irrigation system is described in which the delivered water is filtered so that it is substantially free of particulate matter of troublesome size and still flows through the system with a relatively low-pressure loss. The system comprises in combination: an inlet conduit to receive a supply of water to be distributed; a sand filter system adapted to be backwashed connected to the inlet conduit; a manifold receiving filtered water from the filter system; a number of distribution conduits connected to and receiving water from the manifold; and at least one emitter connected to each distribution conduit for emitting water. Optional features of the invention provide the system with adjustments for control such as a penetrable self-sealing plug and a gauge with a probe adapted to penetrate the plug for measuring the pressure in the distribution conduits. Another feature is a filter arrangement where a portion of a sand filter system can be backwashed while another portion of the system continues to supply filtered water for irrigation. Another option is the provision of downstream retention screens together with sight-glasses for visual inspection of the condition of the screens to assure that the upstream filter means have not broken down. (Sinha-OEIS)
W76-02249

STOMATAL MOVEMENT AND WATER RELATIONS IN CROPS: 2. STOMATAL BEHAVIOR OF TOBACCO LEAVES OF DIFFERENT AGES AND THE INFLUENCE OF SOIL WATER SHORTAGE, (IN JAPANESE),
Ehime Univ., Matsuyama (Japan). Coll of Agriculture.
For primary bibliographic entry see Field 2I.
W76-02252

METHOD AND APPARATUS FOR CONTROLLED DRIP IRRIGATION FROM CHAMBER MEANS LOCATED AT VARYING ELEVATIONS ALONG SOIL AREAS TO BE IRRIGATED,
E. S. Pira.
U.S. Patent No 3,912,165, 8 p, 14 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 939, No 2, p 786, October 14, 1975.

Descriptors: *Patents, *Irrigation, *Surface irrigation, *Subsurface irrigation, *Irrigation practices, Irrigation systems, Fluid friction, Pressure, Irrigation design.
Identifiers: *Drip irrigation.

A method and apparatus is described for furnishing fluid material throughout an irrigation system in a manner such that discharge of substantially uniform volumes of fluid may be realized at a number of discharge outlets located at varying distances from a pressurized fluid source and occurring at elevational differences of a significant nature. Water, under relatively high pressure, is first conducted through a pressure-reduction stage connected to the chamber body. Discharge of water takes place at spaced apart dripper outlets connected into the chamber body. The total volume of water discharged from the chamber and the degree of pressure drop are controlled in relation to one another to reduce and maintain the flow rate within a specific range of low velocity flow rates at which no appreciable friction losses take place with water being discharged uniformly at all dripper outlets. Within the low velocity range of flow rates, certain classes of dripper outlets, i.e. dripper outlets of short orifice length, tend to become sensitive to certain other small pressure changes induced, for example, in chamber portions occurring at lower elevations than other chamber portions. There may occur loss of uniformity of discharge. Uniform release of material through all of these dripper outlets of short orifice length is realized by releasably confining a small column of water in the path of flow exiting from the dripper outlets. (Sinha-OEIS)
W76-02256

AUTOMATICALLY OPERATED WATER DISTRIBUTION SYSTEMS SUCH AS LAWN AND GARDEN SPRINKLING SYSTEMS AND TIMER OPERATED VALVE THEREFOR,
D. R. Simon.
U.S. Patent No 3,912,167, 4 p, 7 fig, 5 ref; Official Gazette of the United State Patent Office, Vol 939, No 2, p 787, October 14, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Water distribution(Applied), Control systems, Timing, Valves.

This invention related to timer operated valve mechanisms, particularly to those adaptable for use in automatic sprinkling systems. In a preferred system a number of such valves are connected to a source of water under pressure in a series arrangement. Each valve includes a manually settable timer for selecting the discharge period of its associated valve, and a water flow operated release means for initiating the cycle of the timer. Setting the timer serves to connect the valve inlet to a discharge outlet and to block a by-pass outlet. When the water supply to the system is turned on, water flows through the discharge of the first valve in the series and initiates the cycle of its timer. At the end of the set time period, the timer causes the valve to block the discharge and open the by-pass thereby supplying water to the second valve in the series. Each valve in the series cycles in this manner for a period determined by the setting of its associated timer. The last valve in the series may have its by-pass outlet capped thereby providing for automatic termination of the watering cycle. (Sinha-OEIS)
W76-02257

IRRIGATION SYSTEMS,
Conflow Irrigation Systems, San Diego, Calif. (Assignee).
H. G. Lodge.
U.S. Patent No 3,912,169, 4 p, 9 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 2, p 788, October 14, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Irrigation design, Distribution systems, Trees.

This invention provides an irrigation system which is particularly suitable, but not limited to, the irrigation of trees and is so arranged that a series of irrigation devices may be arranged for the supply of water to each tree, each device being individually adjustable to meet the needs of its cor-

responding tree, the water being discharged onto the ground in small streams to eliminate runoff or drift of water during severe wind conditions. The irrigation system utilizes a novelly arranged irrigation device in which a single valve controls the water supply to a manifold having a number of outlets, thus permitting the use of a larger valve which is less likely to be obstructed by particulate matter, the valve and manifold also arranged to cause turbulent flow within the manifold which effect substantial pressure reduction below supply pressure, permitting further increase in valve port opening for a given outlet flow. The irrigation device, contains manifold outlets connected to a set of highly flexible distributor tubes of small diameter which are capable of conforming to the ground surface or being superficially covered. The tubes are of such length that their discharge ends may be located in a uniform pattern within the drip line of the tree or other pattern best suited to the needs of the tree. The distributor tubes may be tied in knots to reduce or close off flow, or joined together by a sleeve to close off a pair of tubes, or joined to a larger tube to extend the range. (Sinha-OEIS)
W76-02258

LIGHTWEIGHT TRAVELING IRRIGATION SYSTEM,
R. F. Reinke.
U.S. Patent No 3,912,170, 4 p, 3 fig, 2 ref; Official Gazette of the United States Paten Office, Vol 939, No 2, p 788, October 14, 1975.

Descriptors: *Patents, *Irrigation systems, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Irrigation design, Lateral conveyance structures, Structural stability, Aluminum alloys.
Identifiers: Traveling irrigation systems.

A lightweight irrigation system is described. The system is comprised of flexibly coupled, aluminum pipe sections which are supported above ground by electrically powered, wheeled carriage assemblies also made of aluminum and located at predetermined intervals along the pipe. Each pipe section has a number of interconnecting aligned pipe segments. The pipe sections are supported between carriages by a system of V-jacks and tie rods which work in combination with the pipe to maintain the pipe and carriages in stability and to prevent wallow or wind-whip of the pipe. The tie rods, which extend generally lengthwise of the pipe, are constructed of material having good strength properties and having a thermal coefficient of linear expansion substantially less than that of the aluminum in the pipe such as high quality steel with good corrosion resistance properties. The stie rods serve to maintain the integrity of the overall system against the relatively large thermal expansion and thermal contractin effects experienced by the aluminum components in response to extreme temperature variations. (Sinha-OEIS)
W76-02259

SPRINKLER MOUNTING DEVICE,
V. Johnson.
U.S. Patent No 3,912,171, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 939, No 2, p 788, October 14, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, Irrigation operation and maintenance, Water management(Applied).
Identifiers: Inpulse-type sprinkler.

A device for mounting a sprinkler to a riser is described wherein the riser has a smooth cylindrical inner surface of constant diameter. The device comprises a sleeve that includes an elongated cylindrical outer surface having a cross-sectional diameter less than the diameter of the cylindrical inner surface of the riser and further includes an inner bore of a prescribed diameter that extends the full length of the sleeve. A water delivery tube is included, either as an element of the device or as an element of the sprinkler head. The delivery tube includes a downward-open tubular section that extends through the inner bore of the sleeve. This tubular section includes a cross-sectional outside diameter substantially less than the diameter of the bore within the sleeve. An annular gasket on the sleeve is provided to enable a watertight seal to be formed between the sleeve and riser when the sleeve is inserted into the riser. Another gasket is provided on the sleeve within the bore to facilitate a watertight seal between the sleeve and the water delivery tube. Means to fasten the sleeve and the water delivery tube securely are included. (Sinha-OEIS)
W76-02260

WATER QUALITY CONTROL THROUGH SINGLE CROP AGRICULTURAL, NO 4,
Bemidji State Coll., Minn. Center for Environmental Studies.
For primary bibliographic entry see Field 5G.
W76-02272

THE EFFECTIVENESS OF PRESOWING FLOODING OF THE RICE FIELDS IN KZYLORDIA OBLAST, (IN RUSSIAN),
A. Ibraev, A. M. Nurgizarinov, I. Zh. Arystanov, A. S. Kim, and K. Baimbetov.
Izv Akad Nauk Kaz SSR Ser Biol. 5 59-63. Illus. 1974.

Descriptors: *Rice, Field crops, *Flooding, Flood irrigation, Crop response.
Identifiers: Kazakh-SSR, Kzyl, USSR.

The study was conducted in weedy rice fields in the Kazakh SSR, USSR. April flooding of rice fields reduced the weeds (such as reeds), increased the germination capacity of the seeds, accelerated the development of the plants and increased the rice yield. Thus pre-sowing flooding of the rice fields ensured an increase in the yield by preserving the nutritional substances of the soil such as humus.--Copyright 1975, Biological Abstracts, Inc.
W76-02280

MODELING SOIL WATER MOVEMENT FOR TRICKLE IRRIGATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W76-02365

LINEAR PROGRAMMING ANALYSIS OF BRANCHED PIPE NETWORK,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 044, $4.50 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 49 p, 3 fig, 8 tab, 12 ref, append. OWRT A-041-SDAK(1). 14-31-001-3842.

Descriptors: *Pipelines, Water conveyance, Networks, Cost analysis, Value engineering, Optimization, *Linear programming, Hydraulic engineering, Irrigation, *South Dakota, Pipes, *Design criteria, Irrigation design.
Identifiers: Lagrange multiplier, Shamrock Irrigation Project(So Dak), Branched pipe networks.

The linear programming technique was applied to design an existing water conveyance project--The Shamrock Irrigation Project. An analytical method was developed to obtain a solution which is an adequate approximation to the solution found by linear programming. The analytical method enables the design engineer to select appropriate size of a complex branched pipe network without using the computer. The application of both methods to the Shamrock Irrigation Project was presen
comparison. (Wiersma-South Dakota State)
W76-02366

**CRITERIA FOR DETERMINING FEASIB
OF RURAL WATER SUPPLY SYSTE
LIVESTOCK PRODUCTION AREAS.**
South Dakota State Univ., Brookings. D
Agricultural Engineering
M. Hellickson, and H. Young.
Available from the National Technical In
tion Service, Springfield, Va 22161 as PB-2
$3.50 in paper copy, $2.25 in microfiche. C
tion Report, September 1975. 13 p, 1 fig,
append. OWRT A-042-SDAK(1). 14-31-000

Descriptors: Rural areas, *Water
*Feasibility, Stock water, Water costs, Liv
Potable water, *Alternative costs, *South D
Alternative water use.
Identifiers: *Rural water supply systems.

Agricultural production is dependent to a la
tent on the availability of an adequate
supply. Production is not only limited by t
of vegetative cover for grazing, but also
lack of adequate drinking water. Data are
on costs of present systems, what crite
needed to estimate the cost of these syste
on the cost of alternate water supply syst
livestock producing areas. Personally co
surveys in Stanley and Haakon Counties,
Dakota revealed that water us is 86 perc
livestock (mainly beef cattle) and 14 perc
domestic use. Presently water in the over
lion acre area is supplied from 2349 dar
shallow wells and 54 deep wells. Average
water system cost is $7740 per rancher or
calf sold. Ninety-three percent of the varia
annual water system cost per rancher can
dicted from the number of dams. Total ar
acres and animal units also are reliable crit
predicting annual water cost. Annual c
selected community water supply system
from $1800 to $2400 per rancher pe
(Wiersma-South Dakota State)
W76-02367

**THE DEMAND FOR AGRICULTURAL W
IN UTAH,**
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6I
W76-02383

**SOYBEAN AND CORN ROOTIN
SOUTHWESTERN MINNESOTA: I. WAT
TAKE SINK,**
Agricultural Research Service, Pendleton,
R. R. Allmaras, W. W. Nelson, and W. B.
Voorhees.
Soil Science Society of America Proceedin
39, No 4, p 764-771, July-August 1975, 8 fig
18 ref.

Descriptors: *Soybeans, *Corn(Field),
systems, *Absorption, *Transp
*Minnesota, Soil water movement, On-
vestigations, Nuclear meters, Evapotransp
Soil properties, Hydraulic conductivity, H
water, Depth, Hydraulic gradient, Tensio
Instrumentation, Evaporation pans, Soil
plant relationships.
Identifiers: Determinate isolines, Indete
isolines, Water uptake, Neutron probes.

Sink terms in the transient soil water flow e
were estimated to provide accurate descrip
field water uptake. Water uptakes by ve
developing root systems of three crop
described as a function of time during dry
Nicollet soil, which often has a perched
table at 1.3 to 2 m early in the growing seaso
ing the period July 1 through August 15, wa
take by corn was compared with that by
minate and indeterminate isolines of 'H

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n. These accounts of water uptake were mpared with directly examined rooting pat- Water depletion measurements 05 (with probe) underestimated transpiration ng in late July when upward water flows at were 0.4 to 0.6 of transpiration. Depletions peans occurred at shallower depths than he indeterminate isoline showed greater ns than the determinate isoline at shallow Integrals of the sink term early in the overestimated by 20% the sum of depletion ward movement into the rooting depth. n the test period sink term integrals un- nated the same sum by 25%. (Visocky-

403

TERIZED REDUCTION OF ROLOGIC MEASUREMENTS FROM TED AND NONIRRIGATED PLOTS IN AL UTAH,
Young Univ., Provo, Utah. Dept. of
nary bibliographic entry see Field 7C.
600

ATER QUANTITY NAGEMENT AND NTROL

ontrol Of Water On The face

ID CAPABILITY MODEL FOR THE R LAKE MONROE WATERSHED,
Univ., Bloomington. Water Resources h Center.
iesa, M. C. Roberts, J. C. Randolph, and R.
e from the National Technical Informa- vice, Springfield, Va 22161 as PB-247 573, paper copy, $2.25 in microfiche. Purdue ity Water Resources Research Center, fayette, Indiana, Technical Report No 66, 5. 27 p, 1 fig, 4 tab, 12 ref. OWRT A-039-

tors: *Land use, *Land classification, development, Recreation, Agriculture, studies, *Indiana, Watershed manage- Computer models, Planning, Alternative g.
ers: *Land capability, Capability analysis, tial, Commercial, *Lake Monroe(Ind).

dy was designed to produce a compu- nventory retrieval system of land-use in- on and a land capability model. The model ovide guidelines for land-use decision based on the environmental factors of the ment potential of land around Lake Mon- nroe County, Indiana. The basic format of el output is a matrix that arrays approxi- 30 parameters of land capability versus 9 s. The land use classification system used modification of a model for the Tulsa olitan Area. The land capability model was d on the basis of the information gathered nd-use survey. This model will be a useful r considering alternative development ls in terms of their environmental impact. a-Purdue)
002

EARTH RESOURCES TECHNOLOGY LITE-1 SYMPOSIUM VOLUME 1: ICAL PRESENTATIONS, SECTION B.
Aeronautics and Space Administration, gton, D.C., Scientific and Technical Infor- Div.
nary bibliographic entry see Field 7B.
026

MEASURING WATERSHED RUNOFF CAPABILITY WITH ERTS DATA,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 7C.
W76-02031

EVALUATION OF REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS,
National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab.
For primary bibliographic entry see Field 7C.
W76-02038

TECHNIQUES FOR COMPUTER-AIDED ANALYSIS OF ERTS-1 DATA, USEFUL IN GEOLOGIC, FOREST AND WATER RESOURCE SURVEYS,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7C.
W76-02053

DEEPWATER PORT ACT OF 1974.
For primary bibliographic entry see Field 6E.
W76-02077

ILLINOIS LAWS RELATING TO WATERWAYS, 1973.
Illinois State Dept. of Transportation, Springfield. Div. of Waterways.
For primary bibliographic entry see Field 6E.
W76-02081

CHAIN OF LAKES STUDY COMMISSION AND ILLINOIS-MISSISSIPPI CANAL AND SINNISSIPPI LAKE COMMISION CREATES-EFFECTIVE DATE.
For primary bibliographic entry see Field 6E.
W76-02084

FLOOD DAMAGE--CREATES ACT TO PREVENT.
For primary bibliographic entry see Field 6E.
W76-02086

COUNTIES (PROVISIONS OF ILLINOIS STATUTES RELATING TO COUNTY JURISDICTION OVER WATERS AND WATERWAYS).
For primary bibliographic entry see Field 6E.
W76-02089

WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES, VOL I,
For primary bibliographic entry see Field 6E.
W76-02105

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 1. BASINS FROM MERMENTAU RIVER TO COLORADO RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02133

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON MOHAWK RIVER, WHITESBORO, NEW YORK,
Geological Survey, Albany, N.Y.
B. Dunn.
Open-file report 75-442, September 1975, 5 p, 1 fig.

Descriptors: *Hydrologic data, *Streamflow, *Flood discharge, *Bridge design, *New York, Design flood, Planning, Evaluation, Design data, Bridge construction, Sites.
Identifiers: *Mohawk River, *Whitesboro(NY), Proposed bridge site.

New York State Department of Transportation plans to relocate a section of County Highway 30 in the towns of Marcy and Whitestown in Oneida County. Two alternate sections that would eliminate a series of broken-back and reverse curves and replace the present structures over the Mohawk River and the New York State Barge Canal are proposed. The planned bridge over the Mohawk River at Whitesboro is identical for alternate plans 1 and 2. The design-flood discharge for the proposed bridge site would be 18,200 cfs (515 cu m/sec), which is about equal to the discharge for the 100-year flood. The elevation at the bridge site for the flood of October 2, 1945, was 411.8 feet (125.5 metres). Alternate-bridge designs 1 and 2 would cause 0.2 foot (0.06 metre) increase in water level. (Woodard-USGS)
W76-02136

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON WEST BRANCH DELAWARE RIVER, DELHI, NEW YORK,
Geological Survey, Albany, N.Y.
B. Dunn.
Open-file report 75-441, September 1975, 9 p, 4 fig, 1 tab, 3 ref.

Descriptors: *Hydrologic data, *Streamflow, *Flood discharge, *Bridge design, *New York, Design flood, Planning, Evaluation, Design data, Bridge construction, Sites.
Identifiers: *West Branch Delaware River(NY), *Delhi(NY), Proposed bridge site.

New York State Department of Transportation plans to build an access road from State Highway 10 to the Valley Campus of the State University Agricultural and Technical College at Delhi. This access road would cross the West Branch Delaware River at Delhi, about 750 ft upstream from the present Sherwood Road bridge. The 100-year, design-flood discharge at the proposed bridge site sould be 9,300 cfs (260 cu m/sec). Elevation for the 100-year flood at the site would be 1,345.1 feet (410.0 metres) above mean sea level. Increase in water level upstream from Sherwood Road bridge for the 100-year flood would be 1.2 feet (0.4 metres). Increase in water level caused by the various openings of the proposed bridge would range from 5.6 feet (1.7 metres) to 1.1 feet (0.3 metre) at the approach section. (Woodard-USGS)
W76-02137

WATER RESOURCES INFORMATION NEEDS FOR THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT.
Geological Survey, Tallahassee, Fla.
Northwest Florida Management District Tallahassee, 1975, 68 p, 31 fig, 12 tab, 12 ref.

Descriptors: *Water resources, *Hydrologic data, *Florida, *Information retrieval, Surface waters, Groundwater, Water quality, Water demand, Water utilization, Water conservation, Hydrology, Hydrogeology.
Identifiers: Northwest Florida, Water information summary(Fla).

This report summarizes the availability and applicability of existing water resources information to the functions and needs of the Northwest Florida Water Management District. For those parts of the District where data are not already available it outlines the network extensions and the investigations needed to obtain such data. Where some data are available currently but where exigencies of basin management will require detailed or sophisticated information on intermediate-term or long-term programs, the investigations are outlines to afford at least a start in acquiring these data. From the Aucilla River, east of Tallahassee, the 16-county Northwest Florida Water Management District extends 200 miles westward to the Perdido River and the Alabama-Florida state line. The north-south dimension of

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the District is 40-45 miles except at the bulge of the Apalachicola Cape where it is 90 miles. The District is bounded in the north by Alabama and Georgia and on the south by the Gulf of Mexico. (Woodard-USGS)
W76-02138

DISCHARGE AND FLOW DISTRIBUTION, COLUMBIA RIVER ESTUARY,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-02143

REDWOOD NATIONAL PARK STUDIES DATA RELEASE NUMBER 1: REDWOOD CREEK, HUMBOLDT COUNTY, CALIFORNIA, SEPTEMBER 1, 1973-APRIL 10, 1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-02144

HYDROLOGIC DATA FOR COW BAYOU, BRAZOS RIVER BASIN, TEXAS, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-02145

ANALOG-MODEL ANALYSIS OF HYDROLOGIC EFFECTS OF SEWERAGE IN SOUTHEAST NASSAU AND SOUTHWEST SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 5B.
W76-02146

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN SOUTHERN MISSISSIPPI--1974,
Geological Survey, Jackson, Miss.
J. A. Callahan.
Mississippi Board of Water Commissioners, Jackson, Bulletin 75-2, 1975. 59 p, 5 fig, 11 ref.

Descriptors: *Groundwater resources, *Surface waters, *Water supply, *Water quality, *Mississippi, Basic data collections, Water wells, Aquifers, Well data, Water storage, Reservoirs, Water treatment, Industries, Municipal water, Domestic water.
Identifiers: Southern Mississippi.

Total public- and industrial-supply pumpage in the 37 counties of southern Mississippi amounted to 1,920 mgd (84.1 cu m/sec) in 1974. Of the 1,680 mgd (73.6 cu m/sec) pumped from surface-water sources, 792 mgd (34.7 cu m/sec) were brackish water from Back Bay of Biloxi and the Pascagoula River estuary. Public water supplies at Jackson and Meridan use both surface water and groundwater. All other public supplies use groundwater. The groundwater is obtained from aquifers of Eocene age and younger. Although the greater number of industrial supplies are obtained from Miocene aquifers, most of the water pumped for industrial use is from surface sources. (Woodard-USGS)
W76-02148

FLOODS IN THE FAJARDO-LUQUILLO AREA, NORTHEASTERN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 7C.
W76-02150

CRITERIA FOR THE USE OF VERTICAL AVERAGING IN ENVIRONMENTAL DISPERSION MODELS,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2H.
W76-02155

ANALYSIS OF A MULTIPURPOSE WATER RESOURCE SYSTEM IN SOUTHEASTERN MEXICO,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W76-02157

LANDSAT-1 IMAGERY IN HYDROLOGIC STUDIES,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-02163

SURVEY PROBLEMS ALONG THE CALIFORNIA-ARIZONA BOUNDARY,
California State Lands Div., Sacramento. Granted Lands and Area Projects.
R. Minnick.
In: Proceedings of the American Congress on Surveying and Mapping, Fall Convention, October 26-31, 1975, Phoenix, Arizona, p 54-61, (1975), 1 fig, 6 ref.

Descriptors: *Colorado River, *Boundaries(Property), *Arizona, *California, *Land tenure, Legal aspects, Adjacent land owners, Boundary disputes, Water law, Water rights, Land, Land use, Real property, Land management, Decision making, Planning, Channels.

The State of California owns the western half of the Colorado River separating Arizona and California, but to date the property boundaries are still unclear and unmapped. Private landowners are confused; California owns sovereign land in Arizona, and Arizona owns sovereign land in California. In addition, there are Indian and Federal Government land claims. The California State Lands Commission has begun a surveying and mapping program which will attempt to solve these boundary problems. Methods used in establishing surveying and mapping claim lines in the River are discussed. In making decisions on a particular site, questions such as these had to be answered: What is the last natural channel of the River. What effect have the dam and levees had. Is the River in a cut. And, what court cases affect this particular set of facts. These, along with any other facts pertaining to ownership, title, and boundaries, are assembled into a claim line study that draws inferences and discusses alternative claim lines and the support and weight given to each from the assembled facts. Maps, air photos and overlays are assembled from which decisions are made firmly enough so that the claim can be asserted in court if need be. Field work is then planned, surveying is done, and maps are completed and approved by the State Lands Commission. (Robinett-Arizona)
W76-02166

IRRIGATION DISTRICTS OF MEXICO (LOS DISTRITOS DE RIEGO DE MEXICO),
J. Robles Espinosa.
Recursos Hidraulicos, Vol 4, No 1, p 48-63, 1975, 8 fig, 2 tab.

Descriptors: *Mexico, *Irrigation districts, *Irrigation efficiency, *Water distribution(Applied), *Irrigation programs, Governments, Irrigated land, Irrigation, Crop production, Irrigation design, Irrigation practices, Irrigation water, Water conservation, Agriculture, Irrigation engineering, Water management(Applied), Water demand, Salinity.
Identifiers: *Irrigation and Drainage Engineering Office, *Plan de Mejoramiento Parcelario.

Before new water laws were passed it had become evident that it was necessary to improve irrigation efficiency relating to conduction losses, excessive irrigation, improper elevations of the phreatic level, and salination. In order to solv problems, the offices of Irrigation and Engineering were created to determine crop and soil type the most adequate methods, seasons and levels. At first, ma projects were not as successful as planne led to rehabilitation of some of the distri partially improved the water works and substantial increase in production and a r of irrigation levels. The primary activitie Plan de Mejoramiento Parcelario (land ment plan) are described as: (1) the impr of operations and water distribution in save water for the irrigation of new lan cially for second crops, and (2) an assess the consumer enabling him to improve on his lands and increase his prod (Robinett-Arizona)
W76-02167

WATER RESOURCES RESEARCH ON AND RANGELANDS IN ARIZONA,
Colorado State Univ., Fort Collins.
A. R. Hibbert.
In: Vol 4: Hydrology and Water Reso Arizona and the Southwest, Proceeding 1974 Meetings of the Arizona Section, Water Resources Association and the H Section, Arizona Academy of Science, 20, 1974, Flagstaff, Arizona, p 1-9, 8 ref.

Descriptors: *Water resources deve *Arizona, *Forest management, *Range ment, *Water conservation, Ranges, Water policy, Water requirements, Uni Water resources, Water supply, Water u Southwest U.S., Water management(Environmental effects.

An effort by the Eisenhower Consor Western Environmental Forestry Resear derway to provide a sound technical managing water resources on forest an lands in the Southwest. The consortium better our understanding of the rela between man and his open-space enviro order that its quality might be maintai mediate objectives are to develop soun tive, and safe prescriptions for managin water-producing lands within Arizona Southwest. Nine western universities ha forces with the Rocky Mountain Forest a Experiment Station to form the Eisenho sortium for Western Environmental Research which will attempt to accompl objectives. (Robinett-Arizona)
W76-02220

INCREASING FORAGE PRODUCTIO SEMIARID RANGELAND WATERSHE
Agricultural Research Service, Tucso Southwest Watershed Research Center.
J. M. Tromble.
In: Vol 4: Hydrology and Water Reso Arizona and the Southwest, Proceeding 1974 Meetings of the Arizona Section, Water Resources Association and the H Section, Arizona Academy of Science, 20, 1974, Flagstaff, Arizona, p 33-40. 1 fig ref.

Descriptors: *Forage grasses, *Semiarid *Grama grasses, *Crop production, management, Hydrologic data, Range Small watersheds, Precipitation(Atmo Ranges, Planting management, Plant Vegetation establishment, Water requi *Arizona.
Identifiers: NM-28 sideoats, Vaughn s Walnut Gulch Experimental Watershed(A

Two native grass species, blue gra sideoats, were successfully seeded on a rangeland on the Walnut Gulch Exp Watershed in Southeastern Arizona. seeding dates selected were those within

most likely to receive precipitation, and
tands were established in two successive
ith average rainfall. Shrubs were killed by
wing at a depth of 14 inches, a procedure
as more than 95% successful in controlling
ng shrubs. Forage production measure-
taken on NM-28 sideoats and Vaughn
s showed a yield of 1,950 and 2,643 pounds
ge per acre, respectively, for the 2 years
ng the seeding, whereas untreated sites
d 23 and 25 pounds per acre of forage.
indicate that success in establishing a
f native grass is increased through use of
hydrologic data. (Robinett-Arizona)
223

LISHING A PROCESS FRAMEWORK
ND USE PLANNING,
Service, (USDA), Berkeley, Calif.
hed Systems Development and Application

nary bibliographic entry see Field 6A.
241

CATION OF REMOTE SENSING IN
WAY DELINEATION,
a Univ., Tucson. Dept. of Soils, Water and
ering.
nary bibliographic entry see Field 7B.
244

OLOGIC ASPECTS OF LAND-USE
ING AT TUMAMOC HILL, TUCSON,
NA,
a Univ., Tucson. Dept. of Soils, Water and
ering.
pkin.
4: Hydrology and Water Resources in
a and the Southwest, Proceedings of the
eetings of the Arizona Section, American
Resources Association and the Hydrology
, Arizona Academy of Science, April 19-
4, Flagstaff, Arizona, p 309-324, 2 fig, 2
ref.

tors: *Hydrologic aspects, *Land manage-
*Small watersheds, *Flood protection,
ization, Land use, Topography, Land
ment, *Arizona, Planning, Soils, Vegeta-
Hydrologic data, Geology, Wildlife,
ology, Floods, Channel improvement,
Vegetation establishment, Erosion control.
ers: *Tumamoc Hill(Tucson Ariz), Land
ning.

oc Hill is an 869-acre desert area near Tuc-
izona which is being considered as a con-
access environmental site. The site's geolo-
s, vegetation, wildlife, and archaeology are
d by water. The largest of the 3 watersheds
ain the hill is rapidly being urbanized up-
presenting potential flooding and erosion
. These problems may be reduced simply,
ically, and wisely in a land-use plan. The
may be managed to reduce hydrologic
by widening stream channels, installing
eckdams, and vegetating the drainageways.
rocedures would slow runoff velocities, in-
the cross-sectional area of flow and
ess coefficient, and provide more water for
ion and wildlife. The land-use plan should
clude environmental education programs
would present important effects of water on
tural ecology and hydrologic aspects of
ed urbanization. (Robinett-Arizona)
245

ATION OF MATHEMATICAL MODELS
EMPERATURE PREDICTION IN DEEP
VOIRS,
bilt Univ., Nashville, Tenn.
nary bibliographic entry see Field 5B.
270

CONIFEROUS STANDS CHARACTERIZED WITH THE WEIBULL DISTRIBUTION,
Forest Service (USDA) , Coweeta Hydrologic Lab. Franklin, N.C.
For primary bibliographic entry see Field 2I.
W76-02276

FACTOR ANALYSIS FOR INTERPRETATION OF BASIN PHYSIOGRAPHY,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2A.
W76-02285

CRITERIA FOR DETERMINING FEASIBILITY OF RURAL WATER SUPPLY SYSTEMS IN LIVESTOCK PRODUCTION AREAS,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-02367

BOISE POST-AUDIT STUDY, HYDROLOGY SUPPORT STUDY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-02372

BOISE POST-AUDIT STUDY, PLAN OF STUDY SUBPROJECT REPORT,
Idaho Dept. of Water Resources, Boise; and Idaho Dept. of Water Resources Board, Boise.
For primary bibliographic entry see Field 6B.
W76-02373

BOISE POST-AUDIT STUDY, ECONOMIC AND ECOLOGICAL HISTORY SUPPORT STUDY,
Idaho Univ., Moscow. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W76-02374

THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOL. V. INLAND WATER RESOURCES.
ECON, Inc., Princeton, N.J.
For primary bibliographic entry see Field 6B.
W76-02382

ECONOMICS OF GREAT LAKES BULK CARRIERS IN WINTER OPERATIONS,
Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
For primary bibliographic entry see Field 6B.
W76-02384

SNOW: NATURE'S RESERVOIR,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2C.
W76-02412

SIMULATION OF EVAPOTRANSPIRATION AND DRAINAGE FROM MATURE AND CLEAR-CUT DECIDUOUS FORESTS AND YOUNG PINE PLANTATION,
Forest Serice (USDA), Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 2D.
W76-02426

SELECTING AND INSTALLING SYNTHETIC POND LININGS,
Van Scoyco and Wiskup, Inc., Washington, D.C.
For primary bibliographic entry see Field 8G.
W76-02431

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS--VOLUME 1. BASINS FROM JAMES RIVER TO SAVANNAH RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02486

LIMNOLOGICAL DATA FOR DONNER LAKE, CALIFORNIA, MAY 1973 THROUGH DECEMBER 1973,
Geological Survey, Sacramento, Calif.
For primary bibliographic entry see Field 2H.
W76-02487

HYDROLOGIC UNIT MAP--1974, STATE OF IDAHO.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02490

HYDROLOGIC UNIT MAP--1974, STATE OF NEVADA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02491

4B. Groundwater Management

WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES, VOL I,
For primary bibliographic entry see Field 6E.
W76-02105

MAP SHOWING THICKNESS OF THE PERMIAN (GUADALUPIAN) CAPTAIN AQUIFER, SOUTHEAST NEW MEXICO AND WEST TEXAS,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-02134

GROUND-WATER LEVELS AND WELL RECORDS FOR CURRENT OBSERVATION WELLS IN IDAHO, 1974,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7C.
W76-02139

HYDROGEOLOGIC AND HYDROCHEMICAL FRAMEWORK, SOUTH-CENTRAL GREAT BASIN, NEVADA-CALIFORNIA, WITH SPECIAL REFERENCE TO THE NEVADA TEST SITE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W76-02140

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--UPPER MISSISSIPPI REGION,
Geological Survey, Sacremento, Calif.
For primary bibliographic entry see Field 6B.
W76-02141

LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL, ARVIN-MARICOPA AREA, CALIFORNIA,
Geological Survey, Sacramento, Calif.
B. E. Lofgren.
Available from Supt of Documents, GPO, Wash, DC 20402, price $3.55. Professional Paper 437-D, 1975. 55 p, 5 plate, 43 fig, 9 tab, 45 ref.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, *Wells, *California, Water utilization, Geology, Hydrologic data, Soil compaction,

LIBRARY U. OF I. URBANA-CHAMPAIGN

Stress, Water levels, Water table, Oil fields, Planning, Groundwater recharge, Forecasting.
Identifiers: *Arvin-Maricopa area(Calif).

One-half of the entire San Joaquin Valley in California is currently (1972) affected by land subsidence caused by man's exploitation of the natural resources. About 4,300 sq mi have subsided more than 1 foot, and maximum subsidence exceeds 28 feet. The Arvin-Maricopa area is the southernmost of the three principal areas of widespread subsidence in the San Joaquin Valley. As of 1970, 700 sq mi of irrigable land, roughly 60 percent of the area, has subsided due to the intensive pumping of groundwater. Maximum subsidence exceeds 9 feet, and the total volume of subsidence (1926-70) is about 1 million acre-ft. Subsidence results from the compaction of water-yielding deposits as intergranular stresses are increased by water-level declines. Also, scattered local areas are affected by the hydrocompaction of moisture-deficient surficial deposits and by subsidence due to the extraction of oil-field fluids. The subsidence/pumpage ratio is a measure of the proportion of the groundwater pumpage represented by mined 'water-of-compaction.' For 1962-65 this ratio varied from a few percent around the perimeter of the subsidence area to more than 40 percent of the area of maximum subsidence. When contoured, these ratios clearly define areas where surface-water imports would have the most significant effect in alleviating subsidence. (Woodard-USGS)
W76-02142

ANALOG-MODEL ANALYSIS OF HYDROLOGIC EFFECTS OF SEWERAGE IN SOUTHEAST NASSAU AND SOUTHWEST SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 5B.
W76-02146

WATER-QUALITY ASSESSMENT OF THE INDIANA DUNES NATIONAL LAKESHORE, 1973-74,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 2K.
W76-02147

GROUND-WATER RESOURCES OF THE CAPE HATTERAS NATIONAL SEASHORE, NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 7C.
W76-02149

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE MACHIAS-LUBEC AREA, WASHINGTON COUNTY, MAINE,
Geological Survey, Augusta, Maine.
1 or primary bibliographic entry see Field 7C.
W76-02151

A GRAPHICAL PROCEDURE FOR CLASSIFYING AQUIFER MANAGEMENT STRATEGY,
Missouri Univ., Columbia. Dept. of Geology.
J. M. Sharp, Jr.
Water Resources Bulletin, Vol 11, No 5, p 1040-1045, October, 1975. 2 fig, 7 ref.

Descriptors: *Aquifer management, *Decision making, *Graphical methods, *Water utilization, *Water source, Groundwater, Aquifers, Administration, Planning, Classification, Water demand, *Arizona.
Identifiers: *Tucson Basin(Ariz).

A graphical procedure is proposed as a visual aid tool for use in aquifer managment decision-making by nonhydrologists. Recent trends significantly affecting management strategy are noted, and a variety of management schemes are considered. The classification method presented demonstrates the importance of water use and source interplay and allows consideration of the time element in aquifer development. The procedure, a modification of Piper's six-variable method that was developed for water chemistry nalaysis, is described and, as an example, applied to groundwater usage in the Tucson Basin (Mills-Arizona)
W76-02159

ARTIFICIAL GROUNDWATER RECHARGE AND WASTEWATER RECLAMATION,
Suffolk County Dept. of Health, N.Y
For primary bibliographic entry see Field 5D.
W76-02197

THE EFFECT OF DEVELOPMENT ON GROUNDWATER IN THE PARKER STRIP,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W76-02236

WATER RESOURCES OF THE INNER BASIN OF SAN FRANCISCO VOLCANO, COCONINO COUNTY, ARIZONA,
Northern Arizona Univ., Flagstaff.
E. L. Montgomery, and R. H. DeWitt.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 183-199. 8 fig, 1 tab, 4 ref.

Descriptors: *Water resources, *Water supply, *Groundwater basins, *Pumping, *Aquifer characteristics, Groundwater mining, Groundwater, Groundwater recharge, Aquifers, Water wells, Water sources, Water yield, Hydrogeology, *Arizona, Water storage, Transmissivity, Storage coefficient, Boundaries(Surfaces), Springs, Perched water, Leakage.
Identifiers: San Francisco Volcano(Ariz), Flagstaff(Ariz).

The Inner Basin is a collapse and erosional feature in San Francisco Mountain, an extinct volcano of Late Cenozoic age, which lies approximately eight miles north of Flagstaff, Arizona. The main aquifer's coefficient of transmissibility is approximately 14,000 gallons per day per foot and the storage coefficient was 0.08. Aquifer boundaries increased rates of drawdown of water levels in the Inner Basin well field. Inner Basin springs which issue from perched reservoirs are not affected by pumpage of Inner Basin wells. Recharge is greater than the average yield from springs and wells in the Basin which has an average of 8,000 acre-feet of water in storage in the principal aquifer. A large amount of water is lost from the Inner Basin aquifer system via leakage into underlying fractured volcanic rocks. It is believed that a part of this water could be intercepted by pumpage from a well constructed in the Interior Valley. (Robinett-Arizona)
W76-02237

STRUCTURAL RELATIONS DETERMINED FROM INTERPRETATION OF GEOPHYSICAL SURVEYS: WOODY MOUNTAIN WELL FIELD, COCONINO COUNTY, ARIZONA,
Northern Arizona Univ., Flagstaff.
P. K. Scott, and E. L. Montgomery.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 200-209. 5 fig, 3 ref.

Descriptors: *Water resources, *Groundwater basins, *Faults(Geologic), *Water wells, *Geophysics, Groundwater, Aquifers, supply, Aquifer characteristics, Water Groundwater mining, Water sources, Wat Hydrogeology, *Arizona, Gravity studie netic studies, Gravimetric analysis, San Municipal water
Identifiers: Flagstaff(Ariz), Woody M Well Field(Ariz)

The Coconino Sandstone of Permian ag principal aquifer for the Woody Mount field, a source of municipal water for th Flagstaff. Highest well yields are found w frequency of occurrence of faults is grea where the aquifer is downfaulted. The wa ranges from 1100 to 1237 feet below the face. The thickness of volcanic flow r creases in the southern part of the well dicating that the underlying Mesoz Paleozoic sedimentary rocks have downfaulted and therefore a greater thic the aquifer is saturated. Geophysical data this study to determine locations and movements on faults can be used to proj tions for future municipal well sites to pr ditional groundwater for the city of (Robinett-Arizona)
W76-02238

PRELIMINARY INVESTIGATION O HYDROLOGIC PROPERTIES OF DIAT IN THE HOPI BUTTES, ARIZONA,
Northern Arizona Univ., Flagstaff.
K. C. Scott, R. J. Edmonds, and E. L. Montgomery.
In: Vol 4: Hydrology and Water Reso Arizona and the Southwest, Proceeding 1974 Meetings of the Arizona Section, A Water Resources Association and the H Section, Arizona Academy of Science, 20, 1974, Flagstaff, Arizona, p 210-216. 1 f

Descriptors: *Water supply, *Grou basins, *Water wells, *Hydrologic pr *Groundwater availability, Petrology, Pe ty, Soil properties, Water properties resources, Recharge, Water quality, Grou mining, Aquifers, Groundwater, Aquifer teristics, Water sources, *Arizona, Wat Hydrogeology, Water storage, Igneous ro
Identifiers: *Diatremes, Hopi Buttes(Ariz

The Hopi Buttes, located in northeastern occur throughout an area of approxima square miles on the Hopi and Navaj Reservations and have an average of 10 i rainfall per year. Because sedimentary fo in the Hopi Buttes area yield only limited quality water, diatremes (volcanic vent st are becoming increasingly important so water. Initial investigations of these diatre gest the following conclusions: (1) diatrem likely to contain groundwater have a greater than one half mile, strata dippi degrees or greater, surface lithologies c of volcanic tuff, and are transected by a diatremes with dense lavas outcropping a face offer least chance of containing grou (3) the water stratification may greatly amount of useable water which can be wi (4) recharge to a diatreme is small; and (5) of a diatreme's size, surface lithology, and location can significantly aid in the ev of the groundwater potential. (Robinett-A
W76-02239

GEOTHERMAL ENERGY SYSTEM AN TROL APPARATUS,
Sperry Rand Corp., New York. (assignee).
H. B. Matthews, and K. E. Nichols.
U.S. Patent No 3,910,050, 11 p, 16 fig, 9 cial Gazette of the United States Patent Vol 939, No 1, p 80, October 7, 1975.

Descriptors: *Patents, *Geothermal *Thermal properties, *Alkaline water, *H

, Electrical power production, Thermal
lants.

vention provides an efficient means for the
ion of electrical power at the earth's sur-
sing energy abstracted from a subterranean
mal source. The apparatus includes means
efficient and reliable generation os super-
steam and a steam driven pumping system
ot water well bottom operated for transfer
hot water to the earth's surface where its
content is transferredto a closed-loop,
urbine-alternator combination for the
ion of electrical power. Cooled, clean
regenerated by the surface-located system
njection into the deep well and the residual,
trated solute-bearing water is pumped back
earth. Reliable operation of the system is
by control arrangements in which the
e of the clean water entering the subter-
steam generator determines the rate of
nass flow through the pump-driving steam
and thus determines the proper pressure of
pumped well water. Thus, by control of the
pressure of the clean water pump at the
surface, the hot pumped well water pres-
accurately determined. This arrangement
rmits starting and stopping of the deep well
g apparatus and allows the adequate lubri-
f the bearings. (Sinha-OEIS)
247

ENT AND NONPOLLUTING METHOD
RECOVERING GEOTHERMAL HEAT
GY,
olf.
tent No 3,911,683, 3 p, 3 fig, 3 ref; Official
of the United States Patent Office, Vol
2, p 625, October 14, 1975.

tors: *Patents, *Geothermal studies,
transfer, *Heat flow, Temperature,
les, Steam turbines, Heat exchangers.
ers: Heat pipe.

ole is drilled into the earth to a depth suffi-
reach strata having geothermal tempera-
f at least 240 deg F. Strata may be liquid,
tc. as long as temperature is at a useful
mal temperature level. A sealed passive
pe is inserted into the well. The heat pipe,
the aid of an active pumping arrangement,
rs the geothermal heat to a steam chamber
ar the surface of the earth. Water injected
steam chamber is converted to steam by
heat pipe, the steam in turn being applied
a steam turbine or other energy conver-
vice. After driving the turbine the steam is
sed to liquid form and pumped back to the
hamber where it is once again converted to
for driving the turbine. The method is
erized by the fact that only heat and not
is removed from the earth, and by the fact
at transfer is accomplished without costly
fficient active pumping apparatus. There-
e method is pollution free and results in no
bsidence. Moreover the efficiency of the
y process is higher than in other forms of
mal energy conversion. (Sinha-OEIS)
255

TS OF LODGEPOLE PINE LOGGING
ESIDUE DISPOSAL ON SUBSURFACE
R CHEMISTRY,
tate Univ., Logan. Dept. of Forestry and
r Recreation.
nary bibliographic entry see Field 5B.
279

MINE REHABILITATION PROBLEMS
H ELEVATIONS,
Service (USDA), Ogden, Utah. Intermoun-
est and Range Experiment Station.
nary bibliographic entry see Field 5B.
281

SOURCES AND SEDIMENT YIELD OF HAWAIIAN WATERSHED AND COASTAL SEDIMENTS,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2J.
W76-02369

AN IMPROVED METHOD OF SILICON-32 MEASUREMENT OF GROUNDWATERS,
Physical Research Lab., Ahmedabad (India).
V. N. Nijampurkar, and B. L. K. Somayajulu.
Proceedings of the Indian Academy of Sciences, Vol 80, No 6, p 289-298, December, 1974. 4 fig, 3 tab, 15 ref.

Descriptors: *Radioactive dating, *Radioactivity techniques, *Tracers, *Phosphorus radiosotopes, *Groundwater movement, Age, Aging(Physical), Radioisotopes, Water chemistry, Groundwater, Trace elements, Water analysis.
Identifiers: *Phosphorus-32, *Silicon-32, Hydrofluorisation, Beta activity.

The usefulness of cosmic ray produced silicon-32 for studying groundwater movements has been realized during the past decade. Two technological development are described in which the chemistry is done more rapidly and efficiently, and the beta activity of phosphorus-32 is assayed with a factor of two better efficiency than the earlier method. A rapid method of separation of P-32 from Si-32 by hydrofluorisation saves considerable time besides being more efficient in the chemical recovery of phosphorus. Similarly, 4 pi beta counting of P-32 activity allows a more accurate estimation of small amounts of this activity. These improvements make it possible to reliably measure amounts of Si-32 as low as 0.1 disintegrations per minute (dpm) present in about 10 tons of water. (Robinett-Arizona)
W76-02455

EVALUATION OF GROUND-WATER DEGRADATION RESULTING FROM WASTE DISPOSAL TO ALLUVIUM NEAR BARSTOW, CALIFORNIA,
Geological Survey, Garden Grove, Calif.
For primary bibliographic entry see Field 5B.
W76-02480

GROUND-WATER RESOURCES OF LACKAWANNA COUNTY, PENNSYLVANIA,
Susquehanna River Basin Commission, Harrisburg, Pa.; and Pennsylvania State Geological Survey, Harrisburg.
J. R. Hollowell, and H. E. Koester.
Pennsylvania Department of Environmental Resources, Harrisburg Water Resources Report 41, 1975. 106 p, 26 fig, 3 plate, 20 tab, 28 ref.

Descriptors: *Groundwater resources, *Well data, *Water yield, *Aquifer characteristics, *Pennsylvania, Water quality, Water pollution sources, Coal mine wastes, Streams, Chemical analysis, Hydrologic data, Maps.
Identifiers: *Lackawanna County(Pa).

Lackawanna County comprises an area of about 450 sq mi in northeastern Pennsylvania. The county is bisected by the Lakawanna Valley, part of a structural basin containing the Northern Anthracite field. Since 1960, suburban development has created a demand for groundwater supplies. The principal aquifer is the Catskill Formation. Other aquifers are utilized, but, because of their small areal extent, they are relatively unimportant. Groundwater occurs mainly in bedding planes, joints, faults, and other fractures in the rocks. Wells drilled into the fractured rock aquifer have yields that range from a half gallon to 300 gpm. Wells drilled in valleys have a median yield of 50 gpm, which is about 40 times that of hilltop and hillside wells. Water from most wells tapping the Catskill Formation is of good quality. It is low in dissolved solids and is primarily a bicarbonate-type water. Mine drainage enters the Lackawanna River at numerous points along its course in Lackawanna County. Dissolved-solids content of the Lackawanna River ranges from less than 30 mg/litre above Simpson to more than 1600 mg/litre at the mouth.
W76-02483

RECLAMATION BY TUBEWELL DRAINAGE IN RECHNA DOAB AND ADJACENT AREAS, PUNJAB REGION, PAKISTAN,
Geological Survey, Boston, Mass.
G. T. Malmberg.
Available from Supt of Document, GPO, Wash, DC, 20402, price $1.15. Water-Supply Paper 1608-0, 1975. 72 p, 7 fig, 5 plate, 14 tab, 14 ref.

Descriptors: *Water reuse, *Groundwater, *Irrigation water, *Asia, *Deserts, Foreign projects, Water resources development, Hydrogeology, Canals, Water storage, Injection wells, Hydrologic data, Groundwater movement, Groundwater recharge, Water utilization, Water quality, Salinity, Dissolved solids.
Identifiers: *Pakistan, *Punjab region(Pakistan).

Around the turn of the century, a network of more than 40,000 miles of canals was constructed to divert water from the Indus River and its tributaries to about 23 million acres of largely unused desert in the Punjab region of Pakistan. The perennial supply of irrigation water made available through the canals instituted the beginning of intensive farming. However, because of generally poor drainage and the high rate of canal leakage, the water table began to rise. By the late 1930's the combined effect of waterlogging and salinity had reduced the agricultural productivity of the region to one of the lowest in the world. In 1954 the Government of Pakistan, in cooperation with the U.S. International Cooperation Administration, undertook a study that resulted in the formulation f a groundwater reclamation program. The principal feature of the program is the utilization of a network of deep wells spaced about a mile apart for the dual purpose of lowering the water table and for providing supplemental irrigation water. Annual water budgets for the first 6 years of project operation indicate that pumping caused a decrease in annual groundwater outflow from about 57,000 acre-ft to 32,000 acre-ft, caused an increase in annual groundwater inflow to the project area from 35,00 acre-ft to 52,000 acre-ft, and depleted about 1.71 million acre-ft of groundwater storage. Pumping has created a circulation system in the groundwater reservoir that will cause a gradual increase in concentration of dissolved solids. Eventually it will become necessary to export or otherwise treat saline water if irrigation is to continue. (Woodard-USGS)
W76-02484

EVALUATION OF MONITORING OF RADIOACTIVE SOLID-WASTE BURIAL SITES AT LOS ALAMOS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-02488

SOLID-WASTE DISPOSAL SITES IN RELATION TO WATER RESOURCES IN THE SEATTLE-TACOMA URBAN COMPLEX AND VICINITY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-02489

GROUND-WATER RECONNAISSANCE IN THE FRESNO NORTHEAST AREA, FRESNO COUNTY, CALIFORNIA,
Geological Survey, Sacramento, Calif.
R. W. Page.
Open-file report 75-315, October 1975. 34 p, 9 fig, 3 tab, 13 ref.

Descriptors: *Groundwater resources, *Hydrologic data, *Hydrogeology, *Aquifer characteristics, *California, Groundwater movement, Specific yield, Storage capacity, Water level fluctuations, Water wells.
Identifiers: *Fresno County(Calif).

The Fresno northeast area includes about 133 sq mi in the central part of California. Four physiographic units occur in the area, the largest of which is the compound alluvial fan of the intermittent streams north of the Kings River. Geologic units consist of consolidated rocks and unconsolidated deposits. The consolidated rocks yield only small quantities of fresh water to wells. The unconsolidated deposits immediately overlie the consolidated rocks and, within their upper part, yield large quantities of water to wells. Total storage capacity in the upper 200 ft is about 1,100,000 acre-ft. The total volume of groundwater underflow moving out of the area is about 60,000 to 70,000 acre-ft per year. Two water-level contour maps indicate that changes in water use over a 12-year period have not greatly affected the direction of groundwater movement. Most of the storage changes in the reservoir have occurred in the upper 100 ft through a long-term water-level fluctuation of less than 40 ft. In general, water levels rise during winter, level off during spring, and decline from summer through autumn. (Woodard-USGS)
W76-02493

GROUND-WATER RESOURCES OF ORANGEBURG COUNTY, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
G. E. Siple.
South Carolina State Development Board, Columbia Division of Geology, Bulletin No 36, 1975. 59 p, 10 fig, 7 tab, 53 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrologic data, *Water quality, *South Carolina, Hydrogeology, Water wells, Water yield, Water utilization, Water level fluctuations, Well data, Chemical analysis.
Identifiers: *Orangeburg County(SC).

Groundwater of good quality in relatively large quantities is available throughout most of Orangeburg County, South Carolina. The northwestern part of the county lies within the upper Coastal Plain physiographic province. It is separated from the lower Coastal Plain (Southeastern part) by the Citronelle escarpment. Throughout most of the county the principal aquifers constitute a multiple-artesian system. The major aquifers in the upper Coastal Plain are the quartzose sands in the Orangeburg Group of Eocene age and the coarse sands and gravels of Late Cretaceous age. In the lower Coastal Plain the major aquifers are in the Santee Limestone of Eocene age and the coarse sands and gravels of Early to Late Cretaceous age. The hydraulic conductivity of the Cretaceous sand aquifers is estimated to range from 1,000 to 1,500 gpd/sq ft. Well yields range from 1,200 to 2,000 gpm and specific capacities range from 25 to 50 gpm/ft (gallons per minute per foot of drawdown). The potentiometric head of this aquifer system (Cretaceous sands) has been lowered about 10 feet during the last 8 years in the Orangeburg area. Wells developed in the Santee Limestone yeild up to 700 gpm and have specific capacities ranging from 0.2 to 15 gpm/ft. Water from the Cretaceous aquifers in very soft, low in dissolved solids, has an average pH of 6.3 and a dissolved iron content of 0.7 mg/litre. Water from the Santee Limestone is moderately hard and has a pH of 7.0 or higher. (Woodard-USGS)
W76-02496

GROUND-WATER HYDROLOGY AND GEOLOGY NEAR THE JULY 1974 PHENOL SPILL AT LAKE BEULAH, WALWORTH COUNTY, WISCONSIN,
Wisconsin Geological Survey, Madison.
For primary bibliographic entry see Field 5B.
W76-02497

A DIGITAL-COMPUTER MODEL FOR ESTIMATING DRAWDOWNS IN THE SANDSTONE AQUIFER IN DANE COUNTY, WISCONSIN,
Wisconsin Geological Survey, Madison.
R. S. McLeod.
Wisconsin Geological and Natural History Survey, Madison, Information Circular Number 28, June 1975. 91 p, 25 fig, 6 tab, 11 ref

Descriptors: *Computer models, *Model studies, *Drawdown, *Aquifers, *Forecasting, *Wisconsin, Digital computers, Computer programs, Aquifer characteristics, Hydrologic properties, Hydrogeology, Sandstones, Projections
Identifiers: *Dane County(Wis)

A digital aquifer program was developed to compute unsteady and steady-state hydrologic changes caused by pumping from a confined aquifer. The program computes head changes in the confined aquifer and the rate and volume of water withdrawn from aquifer boundaries. The program was used to model the sandstone aquifer underlying Dane County, Wisconsin. The aquifer was modeled as a confined aquifer recharged by leakage from the overlying upper aquifer. The physical properties of the aquifer system needed for the model were approximated using aquifer-test data and by matching drawdowns resulting from aquifer development through 1970 with drawdowns computed by the model. The sandstone aquifer should be able to supply the water needs of Dane County well beyond 1990. Maximum regional drawdown of approximately 40 ft (12 m) between 1970 and 1990 were computed by the model. This amount of additional drawdown would not seriously deplete the groundwater supply. (Woodard-USGS)
W76-02498

4C. Effects On Water Of Man's Non-Water Activities

REDWOOD NATIONAL PARK STUDIES DATA RELEASE NUMBER 1: REDWOOD CREEK, HUMBOLDT COUNTY, CALIFORNIA, SEPTEMBER 1, 1973-APRIL 10, 1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-02144

CANYON CREEK MANAGEMENT ANALYSIS,
Forest Service (USDA), Albuquerque, N. Mex.
L. E. Siverts, R. D. Gale, and J. W. Russell.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 278-288, 1 fig, 4 tab, 4 ref.

Descriptors: *Water management(Applied), *Range management, *Forest management, *Forest management, *Environmental effects, Water conservation, Forests, Water resources, Lumbering, Livestock, Grazing, Recreation, Wildlife, Land management, Land development, *Arizona.
Identifiers: Canyon Creek(Ariz).

Canyon Creek is an 8,784-acre unit of land located just below the Mogollon Rim on the Tonto National Forest in Arizona. Many of the uses of the area, such as for timber harvesting, livestock uses and recreation, compete among themselves and also with other values such as natural beauty and wildlife. This study attempts to determine in what areas management sould be emphasized to maximize the total use of all resources within Canyon Creek. An analysis was made of the timber aspects, grazing uses, recreation, land sub possibilities, water resources, and the beauty and wildlife conditions. As a result analysis, the following management dire suggested for the area: efforts should be reduce livestock levels, timber harvesting be restricted to salvage sales and small cuts in areas of timber sites with harve straints, development of campgrounds an should be undertaken in certain timbered timber harvesting is not done, the priva should not be subdivided, and stream im ment work should be done in Canyon C companied by livestock control. (R Arizona)
W76-02242

RESEARCH IN AQUATIC HABITATS A SOUTHEASTERN STATION,
Forest Service (USDA). Franklin, N.C. C Hydrologic Lab.
T. J. Harshbarger.
In: Symposium on Trout Habitat Resea Management Proceedings, September 5-6 Cullowhee, North Carolina, Western C University, Appalachian Consortium Boone, p 102-106.

Descriptors: *Trout, *Aquatic habitats, * animals, *Aquatic insects, Brown, Rainbo vironmental effects, North Carolina, Strea
Identifiers: Southern Appalachian Mountai

Research is urgently needed to provide tec necessary to restore, maintain, or improve imately 20,000 miles of trout stream southern Appalachian Mountains. Studie Coweeta Hydrologic Laboratory in weste Carolina have shown that man's activities the quantity, quality, and stability of water from forest land, and that land manageme tices which affect these parameters also af stream biota. A new program of aquatic research has been started at the South Forest Experiment Station. Intensive res needed to meet demands of trout fis (Forest Service-USDA)
W76-02273

FOREST MANAGEMENT IMPACTS ON WATER FISHERIES,
Forest Service. (USDA) Coweeta Hydrolo Franklin, N.C.
J. E. Douglass, and M. E. Seehorn.
In: Symposium on Trout Habitat Resea Management Proceedings, September 5-6 Cullowhee, North Carolina, Western C University, Appalachian Consortium Boone, p 33-46, 3 fig.

Descriptors: *Forest management, *Aquatic life, *Water pollution, *Erosion, fires, Road construction, Pesticides, Her Fertilization, Revegetation, Environmen fects.
Identifiers: Southern Appalachian Mountai

Erosion is the mechanism likely to dam aquatic resource when a forest is managed. logging, site preparation, and fire all increa sion and stream siltation. Cutting forests in streamflow when it is needed most, but con from hardwood to pine significantly streamflow and, therefore, the size of the habitat. Herbicides and pesticides are c threats, but pollution from these sourc usually be prevented. More research is ne fully assess the effects on the aquatic com of logging debris in streams, channel clear creasing stream temperature from loggin the stream, and changing the nutrient bu streams by fertilization or silvicultural pr (Forest Service-USDA)
W76-02274

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CTS OF MANAGEMENT PRACTICES ON
ER QUALITY AND QUANTITY:
EETA HYDROLOGIC LABORATORY,
TH CAROLINA,
t Service (USDA), Coweeta Hydrologic Lab.
lin, N.C.
rimary bibliographic entry see Field 5G.
02275

CTS OF LODGEPOLE PINE LOGGING
RESIDUE DISPOSAL ON SUBSURFACE
ER CHEMISTRY,
State Univ., Logan. Dept. of Forestry and
or Recreation.
rimary bibliographic entry see Field 5B.
02279

PARRAL SOILS,
t Service, Berkley, Calif. Pacific Southwest
t and Range Experiment Station.
rimary bibliographic entry see Field 2G.
02282

IN VEGETATION MANAGEMENT: ITS
CTS ON SOIL,
t Service, Berkley, Calif. Pacific Southwest
t and Range Experiment Station.
DeBano, and R. M. Rice.
oc., Symposium on Interdisciplinary Aspects
Vatershed Management, Bozeman, Mont.,
327-345.

riptors: *Wildfires, *Wettability,
actants, Soil chemical properties, Soil physi-
roperties, Soil temperature, Forests, Grass-
, Brush, Erosion, Overland flow, Chaparral.
ifiers: *Water repellent soils, Wetting agents,
lands.

may induce numerous physical, chemical,
iological changes in soils. The ability of a soil
ke up water is also affected by wildfires.
ently, a water repellent soil is formed when a
urns over a wildland area. The degree of
repelling that is developed depends upon
hysical properties, biological factors, and the
emperatures that develop during a wildfire.
emperatures generated during brush, grass,
orest fires are high enough to induce water
ency in most coarse textured soils. Chemical
dial treatments have only been partially suc-
ul in reducing water repellency and sub-
nt erosion on brushland in southern Califor-
Forest Service-USDA)
02284

S-WASTING PROCESSES IN WATERSHED
AGEMENT,
st Service, Berkley, Calif. Pacific Southwest
st and Range Experiment Station.
Rice, and J. S. Krammes.
oc., Symposium on Interdisciplinary Aspects
Vatershed Management, Bozeman, Mont.,
231-259, Illus.

riptors: *Lumbering, *Creep, Mass wasting,
slides, Slope stability, Erosion, Chaparral,
vium, Brush control, Vegetation effects,
systems, Road construction, Pore pressure,
ns, Frequency.
ifiers: *Soil slips, *Dry creep, *Brush con-
on, San Dimas Experimental Forest,
ern California.

on by mass wasting processes is often un-
timated because some processes, such as soil
and dry creep, are unspectacular and others,
lides, occur infrequently. Actually, in moun-
us regions, these forms of erosion make up a
proportion of the total erosion. Mass move-
s are especially sensitive to disturbances by
such as road building, logging, and vegetative
pulation. The interactions between road loca-
nd slope stability are discussed. Quantitative estimates of the erosional costs are presented for a brush to grass conversion in southern California. Since existing terrain features indicate the likelihood of slope failure, the erosional cost of activities likely to decrease slope stability can be fairly well appraised in advance. (Forest Service-USDA)
W76-02287

SEDIMENTATION AND TURBIDITY HAZARDS IN WILDLANDS,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W76-02289

CHLORIDE IN NATURAL WATERS OF NEW HAMPSHIRE,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5B.
W76-02361

SELECTED CASES OF CONVECTIVE PRECIPITATION CAUSED BY THE METEROPOLITAN AREA OF WASHINGTON, D.C.,
Maryland Univ., College Park. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W76-02422

4D. Watershed Protection

MAPPING SNOW EXTENT IN THE SALT-VERDE WATERSHED AND THE SOUTHERN SIERRA NEVADA USING ERTS IMAGERY,
Environmental Research and Technology, Inc., Lexington, Mass.
For primary bibliographic entry see Field 7B.
W76-02027

LARGE SCALE COLOR PHOTOGRAPH FOR EROSION EVALUATIONS ON RANGELAND WATERSHEDS IN THE GREAT BASIN,
Nevada Univ., Reno.
For primary bibliographic entry see Field 2J.
W76-02161

MANAGEMENT OF MOUNTAIN WATERSHEDS.
European Forestry Commission, FAO, Eleventh Session of the Working Party, June 3-14, 1974, Ankara, Turkey, Rome, 1975, 57 p, 75 ref.

Descriptors: *Watershed management, *Watersheds(Basins), *Erosion control, *Flood control, *Hydrology, Forest watersheds, Forest management, Recreation, Soil conservation, Environment, Water conservation, Soil management, Environmental control, Avalanches, Erosion, Water management(Applied), Flood protection, Snow management, Mountain forests, Conservation, Mountains, Watersheds(Divides), Tourism, Control, Land management, Europe.
Identifiers: Environmental protection, Forest hydrology, Torrent control.

This report summarizes 74 reports submitted by 36 participants from 11 European countrias discussing the topics of watershed management, torrent control, avalanche control, erosion, environmental protection, forest hydrology, mountain land use planning, flooding, snow management, mountain tourism and related topics. Participant countries included: Austria, Federal Republic of Germany, Spain, France, Italy, Norway, Poland, Romania, Switzerland, Turkey and Yugoslavia. (Robinett-Arizona)
W76-02169

APPLICABILITY OF THE UNIVERSAL SOIL LOSS EQUATION TO SEMIARID RANGELAND CONDITIONS IN THE SOUTHWEST,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2J.
W76-02222

A DETERMINISTIC MODEL FOR SEMI-ARID CATCHMENTS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2E.
W76-02235

UNCERTAINTY IN SEDIMENT YIELD FROM A SEMI-ARID WATERSHED,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2J.
W76-02240

RESEARCH IN AQUATIC HABITATS AT THE SOUTHEASTERN STATION,
Forest Service (USDA). Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 4C.
W76-02273

FOREST MANAGEMENT IMPACTS ON COLD WATER FISHERIES,
Forest Service. (USDA) Coweeta Hydrologic Lab. Franklin, N.C.
For primary bibliographic entry see Field 4C.
W76-02274

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: COWEETA HYDROLOGIC LABORATORY, NORTH CAROLINA,
Forest Service (USDA), Coweeta Hydrologic Lab. Franklin, N.C.
For primary bibliographic entry see Field 5G.
W76-02275

CHAPARRAL SOILS,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-02282

THE HYDROLOGY OF CHAPARRAL WATERSHEDS,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
R. M. Rice.
In: Proc., Symposium on Living with the Chaparral, Riverside, Calif., 1973:27-34, Sierra Club, San Francisco.

Descriptors: *Chaparral, *Forest fire, *Debris avalanches, Wettability, Floods, Mass movements, Sedimentation, Channel erosion, Hydrology budget, Runoff, California.
Identifiers: *Dry ravel, Soil water repellency, Southern California.

The hydrology of southern California chaparral is reviewed. Erosional processes on steep slopes are discussed in considerable detail. Gravity processes of dry ravel and landslides are estimated to account for 80 percent of the erosion on side slopes. Most sediment is carried by high flows which characteristically follow when chaparral is consumed by fire. Most of the sediment in such flows is from remobilized channel alluvial and colluvial deposits. (Forest Service-USDA)
W76-02286

MASS-WASTING PROCESSES IN WATERSHED MANAGEMENT,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-02287

RELATION OF RESERVOIR SEDIMENTATION TO CATCHMENT ATTRIBUTES, LANDSLIDE POTENTIAL, GEOLOGIC FAULTS, AND PREDICTED DENSITY,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W76-02288

SEDIMENTATION AND TURBIDITY HAZARDS IN WILDLANDS,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W76-02289

RELATIVE CONTRIBUTION OF SEDIMENT FROM SOURCE AREAS AND TRANSPORT PROCESSES,
Forest Service, Berkley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W76-02290

ENGINEERING AND ECOLOGICAL EVALUATION OF ANTITRANSPIRANTS FOR INCREASING RUNOFF IN COLORADO WATERSHEDS,
Colorado Univ., Boulder. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3B.
W76-02368

PREFERRED POSITION MODEL AND SUBSURFACE SYMMETRY OF VALLEYS,
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2A.
W76-02410

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

AIRCRAFT AND SATELLITE MONITORING OF WATER QUALITY IN LAKE SUPERIOR NEAR DULUTH,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
J. P. Scherz, M. Sydor, and J. F. VanDomelen.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1619-1636, 1974, 10 fig, 6 ref. NASA NGL 50-002-127, NGL 24-005-263, Army DACW-37-74-C-0014.

Descriptors: *Satellites(Artificial), *Aerial photography, *Remote sensing, *Water quality, *Lake Superior, Turbidity, Suspended solids, Reflectance, Water properties, Analytical techniques, Water supply, Intakes, Lakes, Water pollution, Surveys, Monitoring.
Identifiers: *ERTS, *Duluth(Minn).

Satellite images and low altitude aerial photographs often show vivid discolorations in water bodies. These aerial images are just pretty pictures unless one knows to which water quality parameters the discolorations correlate and how this correlation can be reliably made. Extensive laboratory analysis showed that water reflectance, which causes brightness on aerial images, positively correlates to the water quality parameter of turbidity, which on a particular day correlates to suspended solids. Work with low altitude photography on three overcast days and with ERTS images on five clear days provided positive correlation of image brightness to the high turbidity and solids which are present in Lake Superior near Duluth over 50% of the time. Proper use of aerial images would have shown that an $8,000,000 drinking water intake constructed in the midst of this unpotable, turbid water should have been located 6 miles north in clear, usable water. Noise effects such as skylight reflection, atmospheric effects, and depth penetration also must be understood for operational use of remote sensing for water quality monitoring and were considered. (See also W76-02026) (Sims-ISWS)
W76-02051

QUANTITATIVE WATER QUALITY WITH ERTS-1,
Geological Survey, Lawrence, Kans.
H. L. Yager, J. R. McCauley, G. W. James, L. M. Magnuson, and G. R. Marzolf
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1637-1651, 1974. 20 fig, 4 ref. NASA NAS5-21822.

Descriptors: *Satellites(Artificial), *Remote sensing, *Water quality, *Kansas, Lakes, Reservoirs, Suspended solids, Turbidity, Chlorophyll, Reflectance, Analysis, Analytical techniques, Sampling, Monitoring, Surface waters, Great Plains.
Identifiers: *ERTS.

Analyses of ERTS-1 MSS computer-compatible tapes of reservoir scenes in Kansas along with ground truth show that MSS bands and band ratios can be used for reliable prediction of suspended loads up to at least 900 ppm. The major reservoirs in Kansas, as well as in other Great Plains states, are playing increasingly important roles in flood control, recreation, agriculture, and urban water supply. Satellite imagery is proving useful for acquiring timely low cost water quality data required for optimum management of these fresh water resources. (See also W76-02026) (Sims-ISWS)
W76-02052

APPLICATION OF ERTS DATA TO RESOURCE SURVEYS OF ALASKA,
Alaska Univ. College.
For primary bibliographic entry see Field 7C.
W76-02065

ENVIRONMENTAL STUDIES OF AN ARCTIC ESTUARINE SYSTEM,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W76-02075

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-02132

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN SOUTHERN MISSISSIPPI--1974,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W76-02148

NEW METHOD FOR THE DETERMINATION OF THE TOTAL BOD CONTENT OF WASTE-WATERS (NOVYY METOD OPREDELE BPK-POLNOGO STOCHNYKH VOD),
Y. Y. Lur'e, and V. A. Odaryuk.
Vodosnabzhenie i Sanitarnaya Tekhnika N 28-29, 1975, 4 ref

Descriptors: *Biochemical oxygen de *Analytical techniques, *Pollutant identific Hydrogen ion concentration, Chemical oxyg mand, Organic matter, Inhibitors.
Identifiers: *Ethylene thiourea, Nitrificati hibitors, Reagents.

A method for the determination of the total content of waste waters is described. The m is based upon the addition of ethylene thiou nitrification inhibitor, in a concentration mg/liter, the other reagents are monobasic po um phosphate, dibasic sodium phosphate, ca chloride, ammonium chloride, magnesium su ferrous sulfate, and zinc sulfate. Static or air ing variants of the method are possible. Th value is between 6.5 and 7.5. The method plicable to any waste water, and dilution is sary only at organic matter contents over mg/liter based on the COD value. The requirement for the BOD determination reduced by 2 to 10 times as compared wi dilution method. (Takacs-FIRL)
W76-02193

ADIGE AND PO: CHEMICAL ANALYSES VARIUS WATER EXAMINATIONS CAR OUT AT POLESINE IN 1974 (ADIGE E ANALISE CHIMICHE E INDAGINE V SULLE ACQUE EFFECTTUATS IN POLE DURANTE L'ANNO 1974),
V. Chioffi, G. Magon, A. Milan, and B. Stefa
Inquinamento, Vol 17, No 6, p 12-18, June 1
tab, 19 ref.

Descriptors: *Rivers, *Chemical ana *Sampling, Sewage disposal, Water pol sources, Water pollution effects, *Poll identification, Potable water, Chlorination.
Identifiers: *Po River(Italy), *Adige River(It

Studies were made of the water quality o lower Po and Adige rivers in Italy. From a po each river, samples were taken at time int extending over a year. Records were made of height, and tests were made to determine o parameters, phenols, electrical conductivity monium and other N compounds. phosphates, Cr, Pb, Cu and Zn. Findings tabulated; pertinent topographical feature discussed, as well as sewage disposal pra and treatment methods for drinking Although recently there have not been problems, there are still emergency situatio which the organoleptic characteristics of dri water have been affected. The use of ch dioxide instead of Cl gas is recommended fo prechlorination stage of purification, and chloride is suggested as a replacement for fe sulfate in coagulation. The city of Verona i dumping raw sewage into the Adige, and i suggested that many industries could im their effluent treatment before releasing then these rivers. (Morrow-FIRL)
W76-02195

METHOD AND APPARATUS FOR CONT OUS MONITORING OF DISSOLVED GANICS,
G. Claus.
Canadian Patent 974,082, Issued Septemb 1975. Patent Office Record, Vol 103, No 36, September, 1975.

Descriptors: *Monitoring, *Measure *Dissolved solids, *Organic compounds, *Pa Radiation, Wavelengths, Equipment, Poll identification.
Identifiers: Tyrosine.

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thod and equipment that can be used to mea-
nd continuously monitor the amount of dis-
d organics has been patented. The quantity of
ved organic material in a solvent medium is
ired by passing 280 millimicron light through
edium. The amino acid tyrosine in the medi-
ill absorb radiation of this wavelength. The
ntration of tyrosine can be determined by
iring the adsorbance of the radiation. The
nt of organic material is then calculated by
the known proportional relationship of
ne to the total organic matter. (Orr-FIRL)
02213

**-RELATED CHANGES IN WATER
LITY OF STOCK TANKS OF SOUTHEAST-
ARIZONA,**
ultural Research Service, Tucson, Ariz.
west Watershed Research Center.
rimary bibliographic entry see Field 5B.
02233

ER TESTING DEVICE,
Tower.
Patent No 3,910,764, 3 p, 4 fig, 2 ref; Official
tte of the United States Patent Office, Vol
No 1, p 319, October 7, 1975.

riptors: *Patents, *Water quality control,
r pollution control, *Testing, Sampling,
ment, Chlorine, Hydrogen ion concentra-
*Pollutant identification.

paratus is disclosed for testing water by use
eagent to determine chemical characteristics
as pH or chlorine content. A chamber is pro-
to hold a water sample of fixed predeter-
d amount, and a reservoir or reservoirs are
ded for the selected reagents. A mechanical
er operates a gate which seals the water sam-
hamber, and also activates a mechanism
n forces a predetermined amount of reagent
he water sample chamber. Comparison color
les are provided for comparing the color or
arance of the water reagent mixture in the
sample container to determine the presence
mount of the component for which the water
ng tested. (Sinha-OEIS)
02250

**SUREMENT OF ACTIVE BIOMASS CON-
TRATIONS IN BIOLOGICAL WASTE
ATMENT PROCESSES,**
gia Inst. of Tech., Atlanta. School of Civil
neering.
rimary bibliographic entry see Field 5D.
02268

**IOTOGRAPHIC TECHNIQUE FOR MONI-
ING EROSION ON STRIP MINED LANDS,**
st Service (USDA), Berea, Ky. Northeastern
st Experiment Station.
Allen, Jr., and W. R. Curtis.
graphic Applications in Science, Technology
Medicine, Vol 10, No 4, p 29-31, July 1975, 4

riptors: *Strip mine wastes, *Erosion rates,
iles. *Gages, Appalachian Mountain region,
ment yield, Water pollution sources, Topog-
, Soil erosion.
ifiers: Topographic profiles, Erosion
les, Micro-topographic profile gage.

recently, the amount of sediment eroded
areas disturbed by strip mining has been
y an educated guess. We now have an accu-
measurement system with a sound scientific
. We take a photograph of a microtopographic
le gage precisely positioned in pre-installed
s. The resulting photographs are sample
s that can be run through a chart reader. On
hart reader, the charted information is semi-
natically transferred to punch cards. (Forest
ice-USDA)

W76-02278

DETERMINING THE CHEMICAL OXYGEN DEMAND (COD) OF AN INDUSTRIAL EFFLUENT. COMPARISON OF DIFFERENT METHODS PROPOSED WITH SPECIAL REGARD TO CERTAIN SUBSTANCES CONTAINED IN CANNED FOOD INDUSTRY GENERATED WASTE WATERS (DETERMINAZIONE DELLA DOMANDA CHIMICA DI OSSIGENO (COD) DI UN EFFLUENTE INDUSTRIALE. CONFRONTO TRA I VARI METODI PROPOSTI CON PARTICOLARE RIFERIMENTO ALLE SOSTANZE CONTENUTE IN ALCUNI SCARICHI DELLE INDUSTRIE CONSERVIERE).
For primary bibliographic entry see Field 5D.
W76-02309

CERTAIN PROBLEMS OF SUBSTANTIATING PERMISSIBLE DENSITIES OF SURFACE CONTAMINATION WITH BERYLLIUM, (IN RUSSIAN),
Ministerstvo Zdravookraneniya SSSR, Leningrad. Inst. of Biophysics.
G. F. Kovygin.
Gig Sanit, 2, p 43-45, 1974. English summary.

Descriptors: *Beryllium, Water pollution sources, *Surfaces, *Aerosols, Density, *Air pollution, Air circulation, Wastes.
Identifiers: *Redispersion index.

The standardization of the permissible density of surface contamination is discussed. Its coefficient, which is the ratio of the aerosol concentation to the density of surface contamination, can be used as a redisperions index. Between the density of the surface contamination and the redispersion coefficient there exists an inverse correlation ratio, which diminishes with increases in air movement. The equation obtained makes it possible to calculate the theoretical density of surface contamination, the redispersion of which will not cause formation of aerosol concentrations exceding the maximum permissible concentration of Be aerosols.--Copyright 1975, Biological Abstracts, Inc.
W76-02320

SURVIVAL AND CHLORIDE ION REGULATION OF THE PORCELAIN CRAB PETROLISTHES ARMATUS EXPOSED TO MERCURY,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-02328

UPTAKE OF MERCURY BY FRESHWATER CLAMS (FAMILY UNIONIDAE),
Manitoba Univ., Winnipeg. Dept. of Zoology.
A. L. Smith, R. H. Green, and A. Lutz.
Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1297-1303, August 1975, 2 fig, 3 tab, 21 ref.

Descriptors: *Heavy metals, *Mercury, *Toxicity, *Clams, *Mollusks, Lakes, Sediments, Sampling, Path of pollutants, Animal physiology, Analytical techniques, Absorption, Pollutant identification.
Identifiers: Bioaccumulation, Tissue analysis, Anodonta grandis, Lampsilis radiata, Lasmigona complanata, Methylmercuric chloride, Phenylmercuric acetate, Mercuric chloride.

Mercury concentrations were measured in water, sediments, and three species of clams from lakes with and without reported mercury contamination. Elevated mercury levels in clams were associated with elevated mercury levels in water and sediments. Uncontaminated clams were exposed to three mercury compounds at 1.0, 10.50, and 100 micrograms Hg/liter for up to 3 weeks in the laboratory. The clams concentrated the metal in the order methylmercuric chloride >phenylmercuric acetate> mercuric chloride. The rate of uptake of mercury increased with increasing mercury concentration in the water. In most cases, temperature had no effect on the rate of mercury uptake or elimination. The distribution among organs depended on the compound to which the clams had been exposed. Only methylmercuric chloride was concentrated extensively in foot muscle. Transfer of methylmercuric chloride among organs apparently continued after exposure to the compound had ended. (Klein)
W76-02331

ISOLATION AND IDENTIFICATION OF CONSTITUENTS TOXIC TO JUVENILE RAINBOW TROUT (SALMO GAIRDNERI) IN CAUSTIC EXTRACTION EFFLUENTS FROM KRAFT PULPMILL BLEACH PLANTS,
B. C. Research, Vancouver, (British Columbia).
J. M. Leach, and A. N. Thakore.
Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1249-1257, August 1975, 7 fig, 3 tab, 21 ref.

Descriptors: *Effluents, *Pulp wastes, *Bleaching wastes, *Toxicity, Pulp and paper industry, Salmonids, *Rainbow trout, Organic compounds, Water pollution effects, Analytical techniques, *Pollutant identification.
Identifiers: 3, 4, 5-trichloroguaiacol, 3, 4, 5, 6-tetrachloroguaiacol, monochlorodehydroabietic acid, dichlorodehydroabietic acid, 9.10-epoxystearic acid.

Five compounds were characterized from effluent from the caustic extraction stage of a bleach plant at a pulpmill as toxic to juvenile rainbow trout (Salmo gairdneri). The compounds and their LC50 measured in static bioassays were: 3, 4, 5-trichloroguaiacol (0.75 mg/1), 3, 4, 5, 6-tetrachloroguaiacol (0.32 mg/1), monochlorodehydroabietic acid (0.6 mg/1), dichlorodehydroabietic acid (0.6 mg/1), and 9.10-epoxystearic acid (1.5 mg/1). T..e same toxic compounds were also found in caustic extraction effluents collected from other pulpmills.(Klein)
W76-02332

CHLORIDE IN NATURAL WATERS OF NEW HAMPSHIRE,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5B.
W76-02361

REMOTE SENSING OF WATER QUALITY IN PRAIRIE LAKES,
South Dakota State Univ., Brookings. Dept. of Botany and Biology.
D. Moore, and L. Haertel.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 040, $4.50 in paper copy, $2.25 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, September 1975. 61 p, 6 fig, 35 tab, 38 ref, append. OWRT B-039-SDAK(1). 14-31-0001-5114.

Descriptors: *Remote sensing, Water quality, Lakes, Photography, Aerial photography, *South Dakota, *Pollutant identification, Forecasting, Algae, Nutrients, Nitrates, Chlorophyll, Nitrogen, Phosphorus, Correlation analysis.
Identifiers: LANDSAT-1, *Prairie lakes.

The possibility of predicting prairie lake water quality using remote-sensing data during the 1974 open water season was investigated with four lakes in northeastern South Dakota. Water quality samples were collected to coincide with satellite (LANDSAT-1) overoverpasses and low-altitude aircraft flights. Twelve different remote-sensing estimates were taken from LANDSAT-1 imagery,

low-altitude aircraft photographs, ground-based radiometer readings, and ground-level photographs. These were correlated with prairie lake water transparency (secchi depth) and algae abundance (chlorophyll 'a' and total cell concentrations). Correlations between the three water quality parameters and physical factors (rainfall, solar energy, wind velocity, water temperature, and water depth) and nutrient levels (nitrogen and phoshorus) were also determined. Decreased water depth was associated with higher nutrient levels, increased total algae and chlorophyll 'a', and decreased water transparency. Nitrate appeared to be the principal nutrient positively correlated with algal abundance. Extensive ground-level photographic or radiometric measurements are impractical in many operational programs since the time involved on the ground would justify collection of actual water samples. Low-altitude aerial photographs offer finer resolution of small areas but are more expensive to obtain than satellite data. LANDSAT-imagery offers practical potential for measuring prairie lake water quality. It provides frequent and total coverage of a region at an inexpensive cost. (Wiersma-South Dakota State)
W76-02363

PCB IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 141, $9.25 in paper copy, $2.25 in microfiche. Water Resources Scientific Informaiion Center, Report OWRT/WRSIC 75-208, December 1975, 295 p.

Descriptors: *Polychlorinated biphenyls, *Bibliographies, Water pollution, *Pollutant identification, *Abstracts, *Chlorinated hydrocarbon pesticides, *Pesticide residues.

This report, containing 177 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base searched had 39,106 abstracts covering SWRA from January, 1973 (Volume 6, Number 1) through October, 1975 (Volume 8, Number 20). Author and subject indexes are included. (See also W73-06501)
W76-02371

WATER QUALITY MONITORING AND RIVER BASIN PLANNING: A CRITIQUE AND SOME RECOMMENDATIONS,
Rutgers-The State Univ., New Brunswick, N.J. Div. of Urban Studies.
M. R. Greenberg, R. M. Hordon, L. Zobler, and G. W. Carey.
Journal of Environmental Management, Vol 2, No 4, p 319-330, 1974. 8 ref.

Descriptors: *Planning, *Data collections, *New Jersey, Monitoring, Water pollution control, Sampling, Data storage and retrieval, Regulation.

The validity of water related policies based on sophisticated system designs, which in turn, are based on erratic data collection and inconsistent sampling, is faulted. The water monitoring system in the densely developed portion of northeastern New Jersey is evaluated and recommendations are suggested for its improvement. For example, the data represent too few parameters and show a bias toward indices related to human wastes; groundwater, estuarine, and effluent data is completely inadequate. There is a lack of information on nonpoint water pollution sources, sewage effluent data, and industrial discharges. Sampling sites are chosen only on the degree of accessibility. Sampling frequency varies from 15-minute automatic monitors, to three to four times a year at effluent sources, to once to every two years in wells, all at random intervals. Manual monitoring results are inconsistent between and within some agencies in laboratory precedures, in sampling frequency, and the break-up of data sets when new techniques are introduced. Automatic monitors frequently malfunction. Data recording on field sheets and in files differed widely reflecting the special interest of the collecting agency, random choice, and indifference. Data bookkeeping and formal arrangement for machine processing present analytical difficulties. (Auen-Wisconsin)
W76-02378

TOXICITY OF JELLIED POLYACRYLAMIDE TO OLYZIAS LATIPES AND ITS GROWTH INHIBITING ACTION TO PORPHYRA TENERA, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan).
For primary bibliographic entry see Field 5C.
W76-02391

APPLICATION OF REMOTE SENSING FOR PREDICTION AND DETECTION OF THERMAL POLLUTION,
Miami Univ., Coral Gables, Fla. Inst. of Clean Energy Research.
T. N. Veziroglu, and S. S. Lee.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-10572, $5.00 in paper copy, $2.25 in microfiche. NASA Report CR-139182, October 1974. 95 p, 33 fig, 11 tab, 34 ref. NASA NAS10-8498.

Descriptors: *Remote sensing, *Thermal pollution, *Florida, Model studies, Mathematical models, On-site investigations, Water temperature, Powerplants, Thermal powerplants, Pollutants, Water pollution, *Path of pollutants, Satellites(Artificial), Aircraft, Measurement, Bays, Estuaries, Forecasting.
Identifiers: *Biscayne Bay(Fla).

Proper management of thermal pollution will be based on the ability to detect thermal pollution and to alleviate it. In order to obtain a clear description of the physical situation, an accurate prediction of the water body temperature distribution is needed. This study has several objectives: (1) the development and testing of a generalized mathematical model to predict three-dimensional temperature distribution in coastal regions receiving hot discharges, (2) the improvement in the accuracy of the thermal remote sensing by directly relating it to thermal radiation from the sea surface and by better accounting for the absorption in the atmosphere, and (3) the development and testing of an active remote sensing system to measure the water turbidity. In the model development, a rigid-lid model has been developed and results have been obtained for different wind conditions. The next step is to include tidal effects. Biscayne Bay in south Florida, the site of two Florida Power Plant facilities, is being used for model testing. In the experiment part, the design of the measurement system has been completed. A preliminary research flight of this system on an aircraft, in cooperation with satellite thermal I.R. radiometer and ground truth data collection by boat, was carried out. (Sims-ISWS)
W76-02393

INSTRUMENTAL ANALYSIS OF CHEMICAL POLLUTANTS, TRAINING MANUAL,
Environmental Protection Agency, Cincinnati, Ohio. Municipal Permits and Operations Div.
C. R. Feldman.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 893, $9.00 in paper copy, $2.25 in microfiche. Report No EPA-430/1-74-001, April 1970. 267 p, 103 fig, 49 tab, 187 ref.

Descriptors: *Training, *Water pollutants, *Analysis, *Instrumentation, *Chemicals, *Pollutant identification, Pollutants, Sampling, Analytical techniques, Quality control, Mass s trometry, Gas chromatography, Infrared r tion, Spectroscopy, Water analysis, Chrom raphy, Pesticides, Chlorinated hydrocarbon p cides, Organophosphorus pesticides, H metals, Organic compounds, Inorganic pounds, Water chemistry, Chemical ana Methodology, Testing procedures.
Identifiers: Atomic absorption.

A course was designed for analytical chemist others having technical responsibility for the lection, identification, and measurement o ganic and inorganic pollutants in the aquati vironment. Lecture and laboratory outlines ing with the instrumental analysis of certain p tants found in water (such as metals, chlori hydrocarbons and organophosphorus compo were included. Topics covered were sampl lection and isolation, quality control, mass trometry, gas chromatography, infrared, emi spectroscopy, and atomic absorption. (Robi ISWS)
W76-02395

SOURCE IDENTIFICATION OF OIL SPILL PATTERN RECOGNITION ANALYSIS NATURAL ELEMENTAL COMPOSITION,
Washington Univ., Seattle. Lab. for Chemo rics.
D. L. Duewer, B. R. Kawalski, and T. F. Scha
Available from the National Technical Info tion Service, Springfield, Va 22161 as AD-471, $4.00 in paper copy, $2.25 in microfich terim Technical Report, August 1974-Jan 1975, February 1975. 37 p, 2 fig, 10 tab, 2 ONR N00017-67-A-0103-0036, NSF GP-42013

Descriptors: *Oil spills, *Classifica *Laboratory tests, *Water pollution sou Evaluation, *Pollutant identification, ments(Chemical), Neutron activation ana Analytical techniques, Statistical methods, processing, Measurement.
Identifiers: Pattern recognition.

Pattern recognition techniques were applied t problem of determining the source of an oil using its elemental composition as analyze neutron activation analysis, when the field sa has undergone weathering. The utility of va elements for making this determination wer sessed. Classification procedures using parisons of the field sample to single ('p known source samples and to multiple ('fuzzy tificially weathered source samples of a given were presented and discussed. The us techniques, such as the K-Nearest Neig (KNN) and Statistical Isolinear Multiple ponent Analysis (SIMCA), which utilize 'fu rather than 'point' sources clearly gave sup results. These techniques are not only intrinsi less sensitive to deviations from an 'ideal' so whether induced by weathering, contaminati analytical error, but can utilize the informatio plicit in the deviations themselves. Because superior generality, SIMCA appears to be the single method currently available for problem volving non-random deviations from a so (Humphreys-ISWS)
W76-02397

BACTERIAL CONTENTS OF SEWAGE FR LARGE HOG FARMS IN ROMANIA, FRANCE),
Institutul Agronomic din Timisoara (Rumania)
B. Tomescu, F. Marschang, R. Minzat, O. Rus and E. Crainiceanu.
Ann Med Vet, Vol 118, No 3, p 185-190, 1974.

Descriptors: *Farm wastes, Hogs, E. *Bacteria, *Pollutant identification, Water p cation, Liquid wastes, Treatment facil Pathogenic bacteria, Salmonella, *Sewage.
Identifiers: Leptospira-Pomona, Leptos Tarassovi, Pathogens, *Romania.

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age water and liquid waste from hog farms in
ania were examined for their bacterial con-
s. Samples from 7 large units produced these
lts: 142 Escherichia coli strains from 23
groups; 126 Salmonella strains from 12 sero-
s; 32 leptospiral strains including 29 from Lep-
ira pomona and 3 from L. tarassovi. Since
e liquids, even when partially purified,
esent serious potential danger from man and
al, installation of adequate purification units
rongly indicated.--Copyright 1975, Biological
tracts, Inc.
-02401

ASUREMENT OF THE APPARENT PH OF WATER WITH A COMBINATION ROELECTRODE,
al Undersea Center, San Diego, Calif. Div. of
mistry and Environmental Sciences.
primary bibliographic entry see Field 2L.
-02415

OSS OF P32-PHOSPHATE AND C14-CAR-NATE ACTIVITY DURING LIQUID SCIN-LATION COUNTING OF AQUEOUS SAM-S,
consin Univ., Madison. Water Chemistry Pro-
n.
C. Weimer, M. G. Rodel, and D. E. Armstrong.
ironmental Science and Technology, Vol 9,
10, p 966-970, October 1975. 3 fig, 3 tab, 8 ref.
A 16010EGR. NSF AG 199, 40-193-69.

criptors: *Pollutant identification,
osphorus radioisotopes, *Phosphates,
rbon radioisotopes, *Radioactivity,
dioisotopes, Phosphorus, Inorganic com-
nds, Carbonates, Phosphorus compounds,
rbonates, Carbon, Analytical techniques,
ioactivity techniques, Analysis, Chemistry,
rumentation, Degradation(Decomposition),
oratory tests.
tifiers: Phosphorus 32, Carbon 14, Loss of ac-
y, Liquid scintillation counting, *Aqueous
ples, Natural decay, Radioactive decay, Phase
aration, Radiocarbon, Activity loss, Solubiliz-
agents, Measured activity, Environmental
mistry.

s of radioactivity in excess of natural decay
observed in aqueous samples of P32-P04(---)
C14-CO3(--) counted by liquid scintillation in a
anebase counting solution. Loss of P32-PO4(--
ctivity was increased by the presence of the
03(-) ion and ranged up to 23% in 8 hr and 46%
days. Common solubilizing agents were ineff-
ive in preventing P32-P04(---) loss and only
ially effective in preventing C14-C03(--) loss.
P32-P04(---) activity was recovered by shaking
recounting the sample, but C14-C02(--) activi-
as incompletely recovered. Settling of insolu-
materials within the counting solution ap-
ntly was responsible for P32-P04(---) activity
. A dual mechanism of precipitation of C14-
(--) and volatilization of C14-C02 was responsi-
for C14 loss. Acidification of the counting solu-
prevented P32-P04(---) activity loss; addition
phenethylamine to the counting solution
vented volatilization of C14-C02, but no treat-
t was found to prohibit C14-C03(--) precipita-
. (Henley-ISWS)
-02417

NUMERICAL EXPERIMENT ON THE EF-CTS OF REGIONAL ATMOSPHERIC POL-TION ON GLOBAL CLIMATE,
d Corp., Santa Monica, Calif.
. Koenig.
rnal of Applied Meteorology, Vol 14, No 6, p
-1036, September 1975, 14 fig, 2 tab, 17 ref.
PA DAHC15-73-C-0181.

criptors: *Air pollution effects, *Clouds,
eather, Rainfall, Nucleation, Condensation,
culation, Air circulation, Climates, Model stu-
dies, Mathematical models, Weather patterns, Precipitation(Atmospheric), Temperature, Air temperature, Radiation, Albedo, Meteorology, Climatology, Air pollution, South America, North America.

The 1973 Rand version of the Mintz-Arakawa model of the general circulation of the atmosphere was used to study the consequences of high concentrations of hygroscopic aersols in a limited geographic region. The experiment was designed to investigate effects of the activity of the aerosol as condensation nuclei, and the consequent abnormal production of cloudiness and alteration of precipitation were of primary concern. Values of meteorological parameters generated by the experiment were compared with values simulated by a control (in which the polluted area was absent). Statistical tests of significance were performed in order to judge the certainty that experimental changes, rather than random wandering of the simulations, actually caused changes in certain variables. Cloudiness increased over the polluted area and the temperature at the surface and in the lower atmosphere became warmer. Rainfall, however, was not significantly altered in the polluted region in spite of changes in the parameterization of the rain that would make rainfall more difficult with a given atmospheric structure. The data suggested a possible connection between North American pollution and South American rainfall. Comparison of data from the experiment and the control indicated that in the experiment, rainfall decreases gradually and steadily within a large area of South America centered on the equator. The immediate cause was the movement of the region of maximum moisture convergence northward, toward, the polluted area, while it is at the same time decreasing in value. (Sims-ISWS)
W76-02420

DETERMINATION OF DISSOLVED GASES IN WATER BY DIFFUSION AND GAS CHROMATOGRAPHIC TECHNIQUES,
Southeast Environmental Research Lab., Athens, Ga.
H. P. Kollig, J. W. Falco, and F. E. Stancil, Jr.
Environmental Science and Technology, Vol 9, No 10, p 957-960, October 1975. 5 fig, 1 tab, 12 ref.

Descriptors: *Pollutant identification, *Gases, *Diffusion, *Water analysis, *Gas chromatography, *Analytical techniques, Instrumentation, Dissolved oxygen, Carbon dioxide, Helium, Nitrogen, Oxygen, Physical properties, Water properties, Chemical analysis, Membranes, Chemistry, Laboratory tests, Aquatic environment, Turbulence.
Identifiers: *Dissolved gases, Plastic membranes, Helium ionization detector, Membrane diffusion, Aqueous systems, Gaseous diffusion, Probe calibration, Gas probes.

A method has been developed for the determination of dissolved oxygen, nitrogen, and carbon dioxide in water. The gases diffuse from the water through a plastic membrane. A stream of helium gas carries the diffused gases to a dual-column gas chromatographic trace gas analyzer equipped with Helium Ionization Detectors. Calibration of the gas probes is performed in a water bath through which analyzed air containing a predetermined amount of carbon dioxide has been bubbled. The system is estimated to have a sensitivity of 5-10 microgram/l of dissolved gas in water. (Henley-ISWS)
W76-02427

SANITARY CHARACTERIZATION OF THE SERGEEVKA RESERVOIR, (IN RUSSIAN),
North Kazakhstan Regional Sanitary Epidemiological Station, Petropavlovsk-Kamchatskii (USSR).
For primary bibliographic entry see Field 5C.
W76-02446

INVESTIGATION OF DIATOM POPULATIONS IN RHITRON AND POTAMON COMMUNITIES IN OAK CREEK, ARIZONA,
Northern Arizona Univ., Flagstaff. Dept. of Biological Science.
R. Johnson, T. Richards, and D. W. Blinn.
Southwestern Naturalist, Vol 20, No 2, p 197-204, June 27, 1975. 1 fig, 2 tab, 12 ref.

Descriptors: *Diatoms, *Aquatic algae, *Water temperature, *Streams, Aquatic microorganisms, *Arizona, Succession, Eutrophication, Aquatic microbiology, Water quality, Limnology.
Identifiers: *Oak Creek(Ariz), *Rhithron zone, *Potamon zone, Current velocity, Diversity.

The study recorded a total of 41 diatom species, 13 of which were previously unreported for Arizona, with quantitative and qualitative changes in populations measured between rhithron and potamon zones (rhithron communities typically have lower temperatures, higher dissolved oxygen and faster current velocities than potamon communities in addition to typically having an epilithic flora with little or no plankton). There was a distinct change from an epilithic cold water flora in the rhithron zone to an epiphytic warm water flora in the potamon zone, and a decrease in diatom diversity was noted between the rhithron and the potamon zone; thirty-four species were collected at rhithron stations at temperautres below 11C, whereas only 20 species were collected at stations with temperatures above this value. Colonization rates in the rhithron zone were greatest at slower current velocities for short incubation periods. Nitzschia palea and Gomphonema parvulum were very common in various regions of the stream bed suggesting nutrient-rich conditions. (Robinett-Arizona)
W76-02458

THE PHYTOPLANKTON OF CANYON LAKE, ARIZONA,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W76-02459

EXPERIENCES WITH BOD DETERMINATIONS, WITH SPECIAL CONSIDERATION OF THE MODIFIED VIEHL DILUTION METHOD (ERFAHRUNGEN MIT DER BESTIMMUNG DES BIOCHEMISCHEN SAUERSTOFFBEDARFS UNTER BESONDERER BERUECKSICHTIGUNG DER MODIFIZIERTEN VIEHL'SCHEN VERDUENNUNGSMETHODE),
Niedersaechsisches Wasseruntefsuchungsamt, Hildesheim (West Germany).
S. Bohmeke.
Das Papier, Vol 29, No 8, p 358-362, August 1975, 2 fig, 18 ref, 1 tab, English summary.

Descriptors: *Biochemical oxygen demand, *Water analysis, Water properties, Dissolved oxygen, Water quality, Nitrification, Inhibitors, Testing, Water pollution sources, Supersaturation, Oxygen.
Identifiers: Viehl BOD dilution method.

Using Viehl's BOD dilution process in serial testing, oxygen losses (often caused by high oxygen supersaturation of the diluting water) can be avoided by reducing oxygen contents to 20 mg/liter. The method is considerably simplified by use of a nitrification inhibitor and a special BOD flask. In the analysis, errors from the dilution effect can be avoided if only oxygen consumptions between 30% and 70% of the original oxygen contents are used for calculating the BOD. (Ward-IPC)
W76-02461

DETERMINATION OF SEVEN TRACE ELEMENTS IN NATURAL WATERS AFTER SEPARATION BY SOLVENT EXTRACTION

AND ANION- EXCHANGE CHROMATOGRAPHY,
Vienna Univ. (Austria).
J. Korkisch, and A. Sorio.
Analytica Chimica Acta, Vol 79, p 207-218, October 1975, 7 ref, 7 tab.

Descriptors: *Trace elements, *Chromatography, *Water analysis, Anion exchange, Analytical techniques, Separation techniques, Cadmium, Cobalt, Copper, Manganese, Lead, Zinc, Metals, Ion exchange, Spectrophotometry, Fluorometry, Chemical analysis, Water pollution sources, *Pollutant identification, Pollutants, Snow, Sea water.
Identifiers: Uranium, Dowex 1-X8 resin, Adriatic Sea.

A method is described for the determination of cadmium, cobalt, copper, manganese, lead, uranium, and zinc in samples of natural waters. After acidification with HCl the water sample is filtered and the diethyldithiocarbamates of the trace elements are isolated by extraction with acetone-chloroform (2:5) at pH 5. Following this preconcentration step the metal ions are adsorbed on a column of Dowex 1-X8 (chloride form) using as sorption solution a mixture (5:4:1) of tetrahydrofuran, methyl glycol, and 6 molar HCl. Successive elution is effected with 6 molar HCl (Co, Cu, Mn, and Pb), 1 molar HCl (U), and 2 molar nitric acid (Cd and Zn); the metal ions in the eluates are determined by atomic absorption spectrophotometry (except uranium, which is determined fluorimetrically). The procedure was used to determine trace metals in water and snow samples collected in Austria and to analyze a sample of water from the Adriatic Sea. (Witt-IPC)
W76-02469

LIMNOLOGICAL DATA REPORT FOR THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION--U.S. GEOLOGICAL SURVEY COOPERATIVE LAKE STUDIES PROJECT,
Geological Survey, Augusta, Maine.
For primary bibliographic entry see Field 7C.
W76-02492

WATER TEMPERATURE-INFLUENTIAL FACTORS, FIELD MEASUREMENT, AND DATA PRESENTATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-02494

GROUND-WATER RESOURCES OF ORANGEBURG COUNTY, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 4B.
W76-02496

5B. Sources Of Pollution

DECOMPOSITION AND DISAPPEARANCE OF ORGANIC DEBRIS IN THREE REPLICATE STREAMS WITH DIFFERENT NITRATE INPUT,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
F. J. Triska, and J. R. Sedell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 574, $4.00 in paper copy, $2.25 in microfiche. Oregon Water Resources Research Institute, Corvallis, Report WRRI-37, October 1975. 45 p, 4 fig, 26 tab, 24 ref. OWRT A-029-ORE(1).

Descriptors: Nitrates, *Decomposing organic matter, Respiration, Organic matter, Streams, Nitrogen, Degradation(Decomposition), Carbon, Leaves, Nutrients.
Identifiers: *Nitrogen concentration, Microbial processing, *Organic debris.

The immobilization and mineralization of nitrogen and phosphorus, the complexing of nitrogen with lignin residues, and changes in the cation exchange capacity in aquatic detritus mimic similar processes of humus formation on land. The role of this debris as surface for microbial colonization, as a prelude to stripping by invertebrates which feed on fine particles, may well be different if the organic particle is incapable of providing a source of energy and nutrients to surface microflora. The quality of such particles should be investigated, as it is exported through successive biological communities. Investigations over the past two years have indicated a capacity for litter and other organic debris to accumulate concentrations of certain elements in relation to decomposition. Rapidly decomposed debris, such as litter, both retains and accumulates nitrogen in the process of decomposition which may be necessary to maintain decomposition rates, and provide sources of essential nutrients for the biotic community. Refractory debris, such as needles and possibly bark and woody debris, also appear to accumulate cations at sometime during decomposition. The understanding of how such organic debris may influence water quality is necessary to properly interpret such data, especially data from small watershed streams where organic debris constitutes a major carbon and nutrient sink.
W76-02001

THERMAL ECOLOGY.
For primary bibliographic entry see Field 5C.
W76-02004

INCIDENCE AND CAUSE OF GAS-BUBBLE DISEASE IN A HEATED EFFLUENT,
North Carolina Wildlife Resources Commission, Raleigh.
For primary bibliographic entry see Field 5C.
W76-02006

TIDAL FLATS IN ESTUARINE WATER QUALITY ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-02071

PHOSPHATE MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-02103

PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No 16, Part III, p 3718-3732, January 23, 1975, 15 p.

Descriptors: *Regulation, *Plastics, *Water pollution sources, *Industrial wastes, *Water quality standards, Penalties(Legal), Discharge(Water), Sewage effluents, Environmental effects, Water quality control, Technology, Economic impact, Liquid wastes, Federal jurisdiction, Water pollution treatment, Water quality, Water purification, Resins, Polymers, Epoxy resins.
Identifiers: Point sources(Pollution), Synthetics.

These regulations establish effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources in the plastics and synthetics category of point sources. The regulations concern the following eight new subcategories: ethylene vinyl acetate copolymers; polytetrafluoroethylene; polypropylene firber; alkyds and unsaturated polyester resins; cellulose nitrate; polyamides; polyester resins (thermoplastic), and silic
The implementation of these guidelines s
substantially reduce the environmental
which would otherwise be attributable to the
tinued discharge of polluted waste waters fro
isting and newly constructed plants in the pl
and synthetics industry. Although the eco
cost of the industry's pollutant discharges
ficult to quantify, studies have shown that
have damaging effects on the quality wate
capacity to support healthy populations of fis
wildlife, and its suitability for industrial, r
tional and domestic use. Various sections
the new subcategories include: the applica
and description of the subcategory; specia
definitions; effluent limitations guid
representing the degree of reduction attainat
the application of the best practible c
technology currently available, and by the
available technology economically achie
standards of performance for new sources
pretreatment standards for new so
(Hoffman-Florida)
W76-02104

HYDROGEOLOGIC AND HYDROCHEM
FRAMEWORK, SOUTH-CENTRAL G
BASIN, NEVADA-CALIFORNIA, WITH
CIAL REFERENCE TO THE NEVADA
SITE,
Geological Survey, Reston, Va.
I. J. Winograd, and W. Thordarson.
Available from Supt. of Documents, GPO
D.C. 20402, price $5.75. Professional Paper 7
1975. 126 p, 40 fig, 3 plates, 15 tab, 149 ref.

Descriptors: *Groundwater movement, *Pa
pollutants, *Nuclear explosions, *Undergr
*Nevada, Hydrogeology, Geochemistry, Ac
characteristics, Transmissivity, Chemical a
sis, Water quality.
Identifiers: *Nevada Test Site.

The U.S. Atomic Energy Commission in
asked the U.S. Geological Survey to study th
currence and the movement of groundw
beneath the Nevada Test Site. Specifically s
was an evaluation of the potential for contai
tion of groundwater in and near the Test Sit
tensely fractured Precambrian and Paleozoi
bonate and clastic rocks and block-fa
Cenozoic volcanic and sedimentary strata i
Nevada Test Site are divided into 10 hydroge
ic units. Three of these, the lower clastic aqu
the lower carbonate aquifer, and the tuff aqu
control the regional movement of groundw
The coefficients of fracture transmissibili
these rocks are, respectively, less than 1
1,000 to 900,000, and less than 200 gallons pe
per foot; interstitial permeability is negli
Major inferences pertinent to the groundw
regimen, made on the basis of hydrochemical
are as follows: (1) Groundwater beneath
Nevada Test Site moves towards the
Meadows area. (2) Chemistry of water in the l
carbonate aquifer may not change marked
depths as great as 10,000 feet. (3) Leakage of
from the tuff aquitard into the lower carb
aquifer is probably less than 5 percent o
spring discharge at Ash Meadows. (4) Under
into the Ash Meadows basin, from Pahra
Valley, may amount to as much as 35 perce
the spring discharge at Ash Meadows. (Woo
USGS)
W76-02140

DISCHARGE AND FLOW DISTRIBUT
COLUMBIA RIVER ESTUARY,
Geological Survey, Denver, Colo.
G. A. Lutz, D. W. Hubbell, and H. H. Stevens
Available from Supt of Documents, GPO, W
DC 20402, price $1.15. Professional Paper 4
1975. 31 p, 18 fig, 7 tab, 22 ref, 2 append.

Descriptors: *Path of pollutants, *Nuclear wa
*Estuaries, Columbia River, *Pacific Ocean,

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ctions, Discharge(Water), Flow characics, Water circulation, Tidal effects, Winds, nent distribution, Saline water.
ifiers: *Columbia River estuary.

level radioactive wastes were discharged into Columbia River at the Hanford Reservation, Atomic Energy Commission, near Richland, ., from 1944 until early 1971. The various onuclides that made up the waste in the river ciated with sediment and biota or remained in ion and were subsequently distributed ghout the estuary and into the Pacific Ocean. provide information on the amount of nuclides being transported through the estuaontinuous records of water discharge were ned near both the upper and the lower ends of estuary during the period 1968-70. A new nique, MOVD (measurement of velocity distion by moving boat), was developed for mining the magnitude and direction of the r velocity throughout the entire depth at a ver- Repetitive measurements at a series of vertion cross sections at the Beaver Army Ter-l, Oreg., Columbia River mile 53.3, and at ria, Oreg., Columbia River mile 14, defined hydrographs at these locations during half cycles on a number of occasions. (Woodard-S)
-02143

LOG-MODEL ANALYSIS OF HYDROLOG-FFECTS OF SEWERAGE IN SOUTHEAST SAU AND SOUTHWEST SUFFOLK COUN-, LONG ISLAND, NEW YORK,
ogical Survey, Mineola, N.Y.
Kimmel, and A. W. Harbaugh.
n-file report 75-535, October 1975. 22 p 7 fig, 3

riptors: *Analog models, *Sewerage, ecasting, *Hydrologic budget, *New York, ndwater, Water levels, Water table, Aquifer acteristics, Hydraulic gradient, Head loss, mflow, Projections.
tifiers: *Long Island(NY).

effect of planned sewerage in southwest Suf- County and southeast Nassau County, New , on water levels and streamflow was evalu- using a three-dimensional electric analog el of the Long Island groundwater system. For 0-year period starting in 1975, declines of 1.5 es (5 feet) in the water table and of as much as tre (3 feet) in head in the Magothy aquifer estimated as a result of Suffolk County rage along. Declines of as much as 6 metres eet) in the water table and 5 metres (17 feet) in nead in the Magothy aquifer were estimated he combined Suffolk and Nassau sewerage. A ne in streamflow in and around the area of rage of 40 percent was estimated using the bined sewerage plans. (Woodard-USGS)
-02146

TER-QUALITY ASSESSMENT OF THE IN-NA DUNES NATIONAL LAKESHORE, 1973-

ogical Survey, Indianapolis, Ind.
primary bibliographic entry see Field 2K.
-02147

ESTIFATION OF VERTICAL MIXING IN DISPERSION OF POLLUTANTS IN LAKE E,
eland State Univ., Cleveland, Ohio. Dept. of nical Engineering.
. Galloway, Jr.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as PB-247 707, 00 in paper copy, $2.25 in microfiche. Comple- Report, September 1975, 315 p. OWRT A-036-O(1).

Descriptors: *Computer models, *Diffusion, *Convection, Mixing, Circulation, Dispersion, Dye release, Lakes, Diffusivity, *Lake Erie, Lake Ontario, Model studies, *Path of pollutants, Water pollution sources.
Identifiers: *Dispersion models, Eddy diffusivity, Rhodamine dye.

A computer dispersion model involving horizontal convection and vertical diffusion was developed to establish criteria for vertical averaging, resulting in greater efficiency of computer solution. Different combinations of vertical profiles of velocity and diffusivity were used. Effective horizontal dispersion coefficients (Ke), for use after vertical averaging, were computed from the results of the model problem and also from a formula given by Csanady. The time to reach the condition for vertical averaging correlated as ti = h2/(d1Dz), while Ke = (C1h2U2)/Dz, where h was depth, Dz was average vertical diffusivity, U was a characteristic velocity and d1 and C1 depended on profiles used. Dye release studies were conducted in Lake Erie near Cleveland under various conditions. The data obtained were not able to shed much light on how Dz varied with depth under essentially isothermal conditions. More experiments of longer duration were required. (See also W76-02153 thru W76-02156) (Chao-Ohio State)
W76-02152

NUMERICAL SOLUTION TO A TWO-DIMENSIONAL DISPERSION EQUATION,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
R. Natarajan.
Master of Science Thesis, August, 1973, 128 p, 43 fig, 9 tab.

Descriptors: *Great Lakes, Dispersion, *Diffusivity, *Path of pollutants, *Lake Erie, Lakes, Model studies, Equations, *Mathematical models, *Distribution patterns, Forecasting, *Diffusion.
Identifiers: Vertical distribution, *Vertical eddy diffusivity.

Many types of dispersion models are being developed to predict the pollutant concentration in the Great Lakes. A two-dimensional form of the general transport equation is numerically solved to obtain the concentration distribution resulting from an initial narrow Gaussian input. Results were obtained for two different velocity profiles and three different di mensionless values of vertical eddy diffusivity (Dz). For a given profile, there is significant vertical variation in concentration as long as the effective horizontal dispersion co-efficient Dx* is increasing. When Dx* reaches a constant value, there is very little vertical variation. The predicted time and space scales for significant vertical variation of concentration appear to correlate well with the computed dispersion examples in the western basin of Lake Erie. The method appears to be generally suitable for determining a priori when vertical variation must be considered in a particular dispersion modeling effort. Since the results are quite sensitive to the Dz values, it appears that Dz should be fairly well defined in order to get accurate prediction of concentration. This necessitates a thorough investigation into the Dz variation in the Great Lakes. (See also W76-02152)
W76-02153

CRITERIA FOR THE USE OF VERTICAL AVERAGING IN GREAT LAKES DISPERSION MODELS,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
S. Vakil.
MS Thesis, June 1975. 99 p, 34 fig, 9 tab, 13 ref, 3 append.

Descriptors: *Computer models, Model studies, Lakes, *Dispersion, Velocity, Diffusivity, *Diffusion, *Path of pollutants.
Identifiers: *Vertical diffusivity, Two-dimensional models, Three-dimensional models.

A model problem involving horizontal convection and vertical diffusion is solved on the computer to establish criteria to choose between two and three dimensional models for large lakes. Different combinations of vertical profiles of velocity and diffusivity were used. The arrival of the horizontal direction variance of the concentration distribution to a linear time dependence was found to be a suitable criterion for the use of vertical averaging. Effective horizontal dispersion coefficients (Ke) for use after vertical averaging were computed from the results of the model problem and also from a formula given by Csanady. Both methods gave good agreement of the values of Ke. The method and results presented have wide application in dispersion modeling for large lakes pertaining to the choice of a two or three dimensional model and an effective horizontal dispersion coefficient for the vertically averaged cases. (See also W76-02152)
W76-02154

CRITERIA FOR THE USE OF VERTICAL AVERAGING IN ENVIRONMENTAL DISPERSION MODELS,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2H.
W76-02155

CRITERIA FOR THE USE OF VERTICAL AVERAGING IN GREAT LAKES DISPERSION MODELS,
Cleveland State Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2H.
W76-02156

SANITARY-VIROLOGICAL STUDY OF SURFACE WATERS, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-02221

A BACTERIAL WATER QUALITY INVESTIGATION OF CANYON LAKE,
Arizona Univ., Tucson. Dept. of Watershed Management.
W. F. Horak, and G. S. Lehman.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 137-143. 4 fig, 4 ref.

Descriptors: *Water quality, *Coliforms, *Streptococcus, *Lakes, *Arizona, Aquatic bacteria, Water quality standards, Water pollution, Farm wastes, Swimming, Aquatic microbiology, Public health, Salmonella, Water analysis, Water pollution sources, Water quality control, Bottom sediments.

Fecal coliform counts in relation to number of swimmers along with fecal streptococci counts of water samples from Canyon Lake in central Arizona are reported. The presence of swimmers was related to an increase in fecal coliforms which was attributed to organisms shed from the swimmers and from agitation of the bottom sediments, consequently dispersing much of the bacteria contained in the benthos. From sampling of the swimming areas it was determined that livestock waste was the primary source of pollution (a greater number of fecal streptococci was found than fecal coliforms), but this interpretation could be misleading due to the higher survival rate of fecal strep than that of fecal coliform organisms. (Robinett-Arizona)
W76-02232

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TIME-RELATED CHANGES IN WATER QUALITY OF STOCK TANKS OF SOUTHEASTERN ARIZONA,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
D. E. Wallace, and H. A. Schreiber.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 144-157. 8 fig, 1 tab, 3 ref.

Descriptors: *Stock water, *Ponds, *Algae, *Water chemistry, *Regression analysis, *Water quality, Farm ponds, Water harvesting, Standing waters, Water storage, Nutrients, Hydrogen ion concentration, Inorganic compounds, Water analysis, Variability, Time, Nitrogen compounds, Potassium, Inflow, Bicarbonates, *Arizona.
Identifiers: Algal growth, Stock tanks, Stepwise linear regression.

This study attempts to determine the water quality changes in stock tanks and what factors are instrumental in the changes, and to assess the effects of the changes. Algal growth was the most prominent change taking place in the tanks with time. Little change in the water chemistry was noted until just before the tanks dried up. As algae died, ions tied up by the algae were released to the water, causing an increase in concentration of many of the nutrients. In order to determine the impact of various factors on algal growth, the data from eight stock tanks were analyzed by stepwise linear regression. Although 20 variables were used in the complete analysis, six variables were associated with 56.3 percent of the variance: time (since first sampling), total N, potassium, pH, Inflow (recharge to the tanks), and HCO3 concentration. Time and total N explained 51.3 percent of the variance, and potassium increased the variance to 52.8 percent. The pH reversed the relative positions of time and total N, with total N becoming dominant. The last two factors, Inflow and HCO3 were negative (resulting in a decrease in algal population) and incrased the coefficient of variance to 56.3 percent. (Robinett-Arizona)
W76-02233

THE EFFECT OF DEVELOPMENT ON GROUNDWATER IN THE PARKER STRIP,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
L. G. Everett, and T. R. Schultz.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 176-182. 4 fig, 1 tab, 3 ref.

Descriptors: *Water quality, *Colorado River, *Septic tanks, *Groundwater movement, *Water pollution, *Recreation facilities, Arizona, California, Water quality standards, Public health, Water pollution, Water analysis, Water pollution sources, Water quality control, Water chemistry, Sewage disposal, Domestic wastes, Permeability, Recreation, Recreation wastes.
Identifiers: Parker Strip.

The Parker Strip is a 14.6 mile river stretch on the Lower Colorado River bounded by Parker and Headgate Rock Dam. This river reach has recently become a high use recreation area with 4,000 permanent residents and up to 120,000 visitors on long weekends. Sewage disposal is exclusively via septic tanks, and recent surveys have localized surface water bacteria levels that may indicate a developing groundwater problem. The deposits in which the septic tanks are located are quite thin and narrow and consist of locally derived sands and gravels which indicate a relatively short flow time for the river. Chemical analysis of groundwater wells has shown high levels of fluoride, chloride, sulfate and total dissolved solids, of which some have been found at levels higher than the U.S. Public Health Drinking Water Standards. Intensive evaluation of the degradation of the water quality in the groundwater of the Parker Strip area is needed to determine whether the groundwater is jeopardized by septic tank systems. (Robinett-Arizona)
W76-02236

EVALUATION OF MATHEMATICAL MODELS FOR TEMPERATURE PREDICTION IN DEEP RESERVOIRS,
Vanderbilt Univ., Nashville, Tenn.
F. L. Parker, B. A. Benedict, and C. Tsai.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/3-75-038, June 1975. 205 p, 201 fig, 23 tab, 19 ref. 1BA032. R-800613.

Descriptors: *Thermal pollution, Reservoirs, *Mathematical models, Lakes, Tennessee Valley Authority, Model studies, Evaluation, *Forecasting.
Identifiers: *Deep reservoir models, Sensitivity analysis.

The deep reservoir model with one-dimensional assumptions can be applied to a reservoir or lake where the principal variation of flow characteristics is in the vertical direction. Among the models evaluated, the MIT deep reservoir model appears to be most easily used and to give results most compatible with the measured temperatures. The temperatures predicted is strongly dependent upon the magnitude of the absorption coefficient of water, and the diffusion coefficient. However, sensitivity analysis shows that an absorption coefficient of about 0.75m-1 and a diffusion coefficient of 15 to 20 times molecular diffusion are appropriate choices for the seven TVA reservoirs studied. The determination of whether or not a reservoir or lake is suitable for the application of a deep reservoir model depends on the Densimetric Froude number. However, the representativeness of the results is not soley dependent upon the Densimetric Froude number. By the use of a fitted curve to the measured temperatures, it was possible to determine the maximum standard error of estimate for the predicted outlet level temperature, 1.6C. Temperatures on individual days may exceed these values and they surely are exceeded at other depths in the reservoir. These limits are suggested as the limit of accuracy of these types of models. (EPA)
W76-02270

IMPROVING THE STATISTICAL RELIABILITY OF STREAM HEAT ASSIMILATION PREDICTION,
R. W. McLay, M. S. Hundal, and K. P. Lamborn.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/3-75-037, June 1975. 157 p, 5 fig, 3 tab, 8 ref, 4 append. EPA 1BA032. 68-03-0439.

Descriptors: *Forecasting, Reliability, *Water temperature, Estimating, *Statistical methods, Thermal pollution, Probability, Model studies, Weather data.
Identifiers: *Heat assimilation prediction, Stream temperature prediction, Sensitivity analysis.

An evaluation is presented of existing, one-dimensional stream temperature prediction techniques for accuracy and precision. A sensitivity analysis of a general model is used in conjunction with statistical methods to determine solution errors. Data taken in 1973 at the Vernon, Vermont nuclear plant are used as a data base. These data are used with Burlington, Vermont airport weather station data to (1) gain insight into the orders-of-magnitude of the various errors and (2) carry out a detailed data analysis to establish probabilit meeting given error requirements. (EPA)
W76-02271

FOREST MANAGEMENT IMPACTS ON WATER FISHERIES,
Forest Service (USDA) Coweeta Hydrologic Franklin, N.C.
For primary bibliographic entry see Field 4C.
W76-02274

A PHOTOGRAPHIC TECHNIQUE FOR M TORING EROSION ON STRIP MINED LA
Forest Service (USDA), Berea, Ky. Northe Forest Experiment Station.
For primary bibliographic entry see Field 5A.
W76-02278

EFFECTS OF LODGEPOLE PINE LOG AND RESIDUE DISPOSAL ON SUBSUR WATER CHEMISTRY,
Utah State Univ., Logan. Dept. of Forestr Outdoor Recreation.
G. E. Hart, and N. V. DeByle.
In: Watershed Management Symp Proceedings, American Society Civil Engine rigation and Drainage Division, August 1975, Logan, Utah, p 98-109. 2 tab, 13 ref.

Descriptors: *Water chemistry, *Nutr *Phenols, *Wood wastes, *Lodgepole pine *Clear-cutting, Chemical properties, Nit Phosphorus, Magnesium, Calcium, Pota Sodium, Organic compounds, Water poll Wyoming, Leaching, Soil water, Burning.

Clearcutting and four different methods of lo residue disposal did not substantially increase centrations of sodium, potassium, calcium, nesium, nitrate nitrogen and phosphorus i waters under lodgepole pine stands northwestern Wyoming. Slight increases of elements were observed following broadcast ing due to conversion of the elements to a soluble form. However, when residues chipped and spread over the logged areas, phenol levels increased roughly 60-fold to 650 ppb in the first post-treatment year. Less creases in phenols occurred where chips removed perhaps due to incorporation of fin ganic material during the logging oper (Forest Service-USDA)
W76-02279

ACID MINE REHABILITATION PROBL AT HIGH ELEVATIONS,
Forest Service (USDA), Ogden, Utah. Interm tain Forest and Range Experiment Station.
R. S. Johnston, R. W. Brown, and J. Cravens.
In: Watershed Management Symp Proceedings, American Society Civil Engine rigation and Drainage Division, August 1975, Logan, Utah. p 66-79, 2 tab, 19 ref.

Descriptors: *Acid mine water, *Mon *Alpine, *Water chemistry, *Soil-water-plant tionships, Mine drainage, Mining, Heavy me Leaching, Soil water, Chemical properties, ecology, Soil environment, Climate, Groundw
Identifiers: Revegetation.

The hydrology, revegetation, and rehabilitati alpine and subalpine mine disturbances are b studied near Cooke City, Montana, in a coo tive project involving the Environmental Pr tion Agency, USDA Forest Service, and the of Montana. Project objectives include the s and demonstration of surface mine rehabilit techniques to achieve acid drainage abatem revegetation, and improved visual impacts high recreation use area. Hydrologic analyse flow patterns and quality of surface, near surf and ground water are being emphasized bec rehabilitation may include hydrologic isolatio

spoil materials. Potential surface treatments being tested on lysimeters containing spoil terial. Related research activities include stus of plant species adaptability, revegetation hniques, plant-soil-water relations, microclitic measurement, and the photosynthetic effincy of native alpine plants. Data collected dur the 1974-75 field seasons will be evaluated and ommendations formulated for rehabilitating the s. (Forest Service-USDA)
6-02281

VIRONMENTAL SYSTEMS LABORATORY.
r primary bibliographic entry see Field 5D.
6-02294

ODUCTION, DISTRIBUTION, USE AND ENRONMENTAL IMPACT POTENTIAL OF LECTED PESTICIDES,
dwest Research Inst., Kansas City, Mo.
r primary bibliographic entry see Field 5C.
6-02316

MMER DISTRIBUTION OF THE ARSHORE FISH COMMUNITY NEAR A ERMAL GENERATING STATION AS TERMINED BY ACOUSTIC CENSUS,
nada Centre for Inland Waters, Burlington ntario); and Fisheries and Marine Service, Otwa (Ontario). Great Lakes Biolimnology Lab.
R. Kelso, and C.K. Minns.
urnal of the Fisheries Research Board of nada, Vol 32, No 8, p 1409-1418, August 1975, 1 ., 3 tab, 7 ref.

scriptors: *Heated water, *Thermal water, ish behavior, *Fish populations, *Methodology, alytical techniques, Seasonal, Summer, hermal pollution, *Lake Ontario, Canada.
entifiers: Acoustic census, Echo counting, Fish nsities, Fish distribution.

e relation between thermal plumes and fish undance and distribution was studied using nultaneous digital echo counting and tempera-re monitoring systems during summer thermal atification of a lake. Fish relative abundance ried from 20.8-1,037 per 10,000 cubic meters and th extremes occurred at 7.5-12.5 meters depth. e fish community in July was pelagic and later came segregated into benthic and pelagic comunities. Thermal plumes appeared to have little fect on pelagic community. (Klein)
6-02321

UX OF CADMIUM THROUGH PHAUSIIDS,
ternational Lab. of Marine Radioactivity, Monte arlo (Monaco). Oceanographic Museum.
r primary bibliographic entry see Field 5C.
6-02327

HLORIDE IN NATURAL WATERS OF NEW AMPSHIRE,
ew Hampshire Univ., Durham. Inst. of Natural d Environmental Resources.
R. Hall.
vailable from the National Technical Informaon Service, Springfield, Va 22161 as PB-248 060, .00 in paper copy, $2.25 in microfiche. New ampshire Agricultural Experiment Station, Durm, Station Bulletin 504, June 1975. 25 p, 9 fig, 3 b. OWRT A-027-NH(1). 14-31-0001-3529.

escriptors: *Chlorides, Water quality, Water poltion sources, *New Hampshire, *Path of pollunts, *Indicators, Tracers, Salts, *Deicers, Corsion, Groundwater, *Pollutant identification.
entifiers: *Road deicing salts.

hloride is a mobile, chemically inactive conituent in natural waters, and for this reason it seful as a tracer or indicator of pollution. Chloride is not harmful to humans except at fairly high concentration; however, associated elements may be harmful at fairly low concentrations. Normal background values must be determined before the effects of human activity can be assessed. Likely natural sources include atmospheric precipitation, dry fallout, rock weathering, and saline water. The major sources arising from human activities can be grouped into the categories of sewage and septic tank effluents, industrial effluents, and road deicing salt. Chloride balances for 1920 and 1970 and scatter diagrams for selected water supplied for 1918-1970 indicate that in New Hampshire chloride increased. This does not seem serious on a statewide basis, but definite problems arise at more local levels due both to direct and indirect effects. Automobile body corrosion, vegetational kills, and damage to concrete have long been known to arise from use of road deicing salt, but there are many other possible difficulties as well. Small ground water reservoirs may not be greatly harmed in the long run by road deicing salt, whereas larger aquifers may undergo long term degradation. Problems are likely to arise in receiving waters such as stream, wetlands, and ponds whether or not ground water quality is seriously impaired. Heavy metals accompnaying chloride or arising from corrosion of home water systems may pose health problems in addition to the better known problems presented by sodium.
W76-02361

SOURCES AND SEDIMENT YIELD OF HAWAIIAN WATERSHED AND COASTAL SEDIMENTS,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2J.
W76-02369

EVALUATING A MATHEMATICAL MODEL FOR PREDICTING LAKE EUTROPHICATION,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W76-02370

SANITARY CHARACTERIZATION OF THE SARATOV RESERVOIR IN THE REGION OF AN OIL REFINERY, (IN RUSSIAN),
Kuybyshevskii Inshonere-Stroitelayi Institut (USSR).
E. D. Starodubtsev.
Gig Sanit, 7, p 113-114, 1974.

Descriptors: *Oil wastes, Industrial wastes, Oil pollution, Water pollution sources, *Biological treatment, Waste water treatment, Water quality, *Sewage treatment, Rivers, Reservoirs.
Identifiers: Saratov reservoir, *USSR(Volga River).

The wastewaters of the oil refinery consist of 20% domestic raw sewage and 80% industrial sewage. The total amount of wastes is 1500-1700 m3/h, discharged directly into the Saratov reservoir on the Volga River (USSR). The hydraulic regime of the flow and water quality were investigated in the wastewater discharge area, without biological treatment (1970), and after construction and operation of biological treatment plants (1971-1972). The overall pollution of the reservoir has decreased significantly.--Copyright 1975, Biological Abstracts, Inc.
W76-02380

TOXICITY STUDIES OF PHOTO-FILM WASTES,
Central Public Health Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5C.
W76-02386

APPLICATION OF REMOTE SENSING FOR PREDICTION AND DETECTION OF THERMAL POLLUTION,
Miami Univ., Coral Gables, Fla. Inst. of Clean Energy Research.
For primary bibliographic entry see Field 5A.
W76-02393

ICHTHYOFAUNA OF CERTAIN RIVERS IN SOUTHERN POLAND,
Wyzsza Szkola Roinicza, Krakow (Poland). Instytut Zoologiczny Stosowanes.
K. Bieniarz, and P. Epler.
Acta Hydrobiol. Vol 14, No 4, p 419-444, 1972, Illus.

Descriptors: *Rivers, *Fish, *Europe, Water pollution sources, Pollution, *Freshwater fish, Salmonids, Oxidation.
Identifiers: Chub, Electric aggregate, *Poland, Ropa River.

The ichthyofauna of certain rivers in Southern Poland was investigated by means of an electric aggregate. Chub dominated in most rivers. It was only on a sector of the River Ropa that salmoids were caught in an appreciable amount. In all the polluted rivers under investigation, an increase in fish was observed below hydraulic structures augmenting water oxidation.--Copyright 1974, Biological Abstracts, Inc.
W76-02405

HYGIENIC STANDARDIZATION OF DD AND DDB COMPOUNDS IN WATER BODIES, (IN RUSSIAN),
Novosibirsk Sanitary Research Inst. (USSR).
B. Y. Ekshtat, N. G. Kurysheva, V. N. Fedyanina, S. P. Tarannikova, and S. F. Yanygina.
Gig Sanit. 9 p 11-14, 1974, Illus.

Descriptors: *Fumigants, *Soil sterilants, *Pesticides, *Organoleptic properties, Organic wastes, Self-purification, Organic compounds, Water quality standards.
Identifiers: *DD, *DDB.

The soil fumigants DD (propane + propylene dichloride) and DDB (isobutane + isobutylene + small amount of metallylchloride) affect the organoleptic properties of water, the self-purification processes of surface waters from organic contamination and the phsiology of warm-blooded animals. The maximum permissible concentration of these compounds in water bodies is 0.4 mg/l according to the sanitary-toxicological index of noxiousness.--Copyright 1975, Biological Abstracts, Inc.
W76-02406

THE ROLE OF TIDAL MIXING IN RUPERT AND HOLBERG INLETS, VANCOUVER ISLAND,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-02413

VERTICAL PATTERNS OF EDDY DIFFUSION DURING STRATIFICATION IN CASTLE LAKE, CALIFORNIA,
California Univ., Davis. Div. of Environmental Studies; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 2H.
W76-02414

HYGIENIC PROBLEMS OF THE DESIGN, CONSTRUCTION AND OPERATION OF GROUP WATER SUPPLY SYSTEMS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Selskoi Gigieny, Saratov (USSR).

A. M. Akimov, V. B. Aksenova, V. P. Rassolova, G. I. Rozhnov, and E. A. Dik.
Gig Sanit. 7 p 98-100, 1974.

Descriptors: *Water supply, *Water pollution sources, Design, Construction, Rivers, *Organic wastes, Water quality, Operation.
Identifiers: Ishim River, Kazakh-SSR. *USSR.

Water quality was studied in 1967-1972 in 2 major water-supply lines of the northern Kazakh SSR, USSR, the Ishim and Bulaevo, and in their source, the Ishim River. The Ishim River is subjected to constant and increasing pollution, primarily of an organic character. A main cause of this is the absence of organized zones for sanitary protection of water intakes of the group water-supply lines, due to shortcomings in their design and construction. The design, construction and operation of the group water supply systems should be completely changed.--Copyright 1975, Biological Abstracts, Inc.
W76-02477

EVALUATION OF GROUND-WATER DEGRADATION RESULTING FROM WASTE DISPOSAL TO ALLUVIUM NEAR BARSTOW, CALIFORNIA,
Geological Survey, Garden Grove, Calif.
J. L. Hughes.
Available from Supt. of Documents, GPO Wash., D.C. 20402, Price $1.20. Professional Paper 878, 1975, 33 p, 13 fig, 8 tab, 29 ref.

Descriptors: *Water pollution, Groundwater, *Waste disposal, *Aquifers, *California, Water quality, Data collections, Chemical analysis, Chemical properties, Biological properties, Industrial wastes, Municipal wastes, Sewage, Groundwater movement, Seepage, Water pollution effects.
Identifiers: *Groundwater degradation, *Barstow area(Calif).

Part of the alluvial aquifer along the Mojave River near Barstow, Calif., has been subjected to pollution from percolation of industrial wastes and municipal sewage for nearly 60 years. Effluent discharges have contained high concentrations of detergents, nitrogen, chromium, oil and grease, phosphates, phenols, and other organic and inorganic chemical substances. The poor quality groundwater resulting from the discharge of these wastes has forced abandonment of several domestic wells because of taste, odor, and foaming and is endangering a well field serving the U.S. Marine Corps Supply Center at Nebo. The nature and occurrence of the degraded groundwater, which is moving in very permeable river-channel deposits at an estimated rate of 1.0-1.5 ft (30-45 cm) per day, is described and outlined both areally and vertically. The concentration of dissolved solids, detergents, dissolved organic carbon, total nitrogen, and chloride were studied in three dimensions. (Woodard-USGS)
W76-02480

A NUMERICAL MODEL OF MATERIAL TRANSPORT IN SALT-WEDGE ESTUARIES, PART I. DESCRIPTION OF THE MODEL,
Geological Survey, Menlo, Park, Calif.
For primary bibliographic entry see Field 2L.
W76-02481

A NUMERICAL MODEL OF MATERIAL TRANSPORT IN SALT-WEDGE ESTUARIES, PART II. MODEL COMPUTATION OF SALINITY AND SALT-WEDGE DISSOLVED OXYGEN IN THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2L.
W76-02482

GROUND-WATER RESOURCES OF LACKAWANNA COUNTY, PENNSYLVANIA,
Susquehanna River Basin Commission, Harrisburg, Pa.; and Pennsylvania State Geological Survey, Harrisburg.
For primary bibliographic entry see Field 4B
W76-02483

EVALUATION OF MONITORING OF RADIOACTIVE SOLID-WASTE BURIAL SITES AT LOS ALAMOS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
T. E. Kelly.
Open-file report 75-406, August 1975. 82 p, 11 fig, 1 tab, 19 ref.

Descriptors: *Nuclear wastes, *Radioactive waste disposal, *Solid wastes, *Reviews, *New Mexico, *Monitoring, Evaluation, Waste dumps.
Identifiers: *Los Alamos(N Mex), *Radioactive solid-waste burial.

Burial of solid radioactive waste began at Los Alamos, N. Mex. in 1943. Most of this waste contained a low level of radioactivity; consequently, only limited monitoring of the hydrogeologic environment has been done in the past. This study was based on a file-and-literature search in order to determine the effectiveness of these monitoring activities. The primary purposes of this investigation were to determine adequancy of current solid-waste monitoring systems at Los Alamos Scientific Laboratory, and to determine improvements to the monitoring program to assure that radioactivity migration from burial areas could be detected. Specific information concerning the total number of curies of waste are tabulated for three sites. (Woodard-USGS)
W76-02488

SOLID-WASTE DISPOSAL SITES IN RELATION TO WATER RESOURCES IN THE SEATTLE-TACOMA URBAN COMPLEX AND VICINITY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-02489

GROUND-WATER HYDROLOGY AND GEOLOGY NEAR THE JULY 1974 PHENOL SPILL AT LAKE BEULAH, WALWORTH COUNTY, WISCONSIN,
Wisconsin Geological Survey, Madison.
R. G. Borman.
Wisconsin Geological and Natural History Survey, Madison, Special Report Number 4, June 1975. 13 p, 4 fig, 1 tab.

Descriptors: *Water pollution sources, *Soil contamination, *Phenols, *Path of pollutants, *Groundwater, *Wisconsin, Data collections, Tracking techniques, Geology, Hydrogeology, Sampling, Water wells, Chemical analysis, Groundwater movement.
Identifiers: *Phenol spill, *Walworth County(Wis).

Lake Beulah, a village in Walworth County, Wisconsin, was the site of a 9,000-gallon (34,000-litre) phenol spill in July 1974. This report provides basic data and information on the groundwater hydrology and geology in the vicinity of the spill. The phenol reached the water table, and groundwater containing phenol is moving southeast through the sand-and-gravel and the Niagara aquifers and should discharge to streams and ditches tributary to Honey Creek. The underlying sandstone aquifer (Cambrian and Ordovician strata) should be unaffected by phenol from the spill because it is overlain by the Maquoketa Shale, which forms a barrier to vertical groundwater movement. (Woodard-USGS)
W76-02497

5C. Effects Of Pollution

DECOMPOSITION AND DISAPPEARANCE ORGANIC DEBRIS IN THREE REPLIC STREAMS WITH DIFFERENT NITR INPUT,
Oregon State Univ., Corvallis. Dept of Fish and Wildlife
For primary bibliographic entry see Field 5B.
W76-02001

THERMAL ECOLOGY.
Available from the National Technical Information Service, Springfield, Va 22161 as CO 730505. $16.25 in paper copy, $2.25 in microfi Proceedings of a symposium held at Aug Georgia, May 3-5, 1973. CONF-730505. Atc Energy Commission, 1974. 670 p.

Descriptors: *Thermal pollution, Water pollu effects, *Heated water, *Thermal water, T perature, *Southeast US, *Ecol *Environmental effects, Model studies, Aqu habitats, Toxicity, Lethal limit, Productiv Cooling water, Nuclear powerplants.
Identifiers: *Thermal ecology.

A primary reason for holding the Thermal Ecol Symposium in Augusta was the nearby prese of the Savannah River Plant, the U.S. Atc Energy Commission plutonium production fa ty. The SRP has the most unique complex of t mal habitats found in North America. Rea cooling water is released at very high temperati into a variety of aquatic habitats including re voirs, natural streams, and large swamps, e composed of complexes of less extensive habi which provide opportunity for a diversity ecological studies. The result is a thermal sp trum ranging from lethal for most organisms normal for the area superimposed on a variety moving- and still-water environments. The proc of these multiple thermal and habitat situation an outdoor laboratory for thermal ecology whic unparalleled in this country. Papers w categorized under the following subject are Physiochemical Phenomena, Physiological Ec gy, Thermal Tolerance and Adaptation, Pop tion Ecology, Behavioral Ecology, Commun Ecology, Productivity, Diversity, and Mod (See W76-02005 thru W76-02025)
W76-02004

COMBINED EFFECTS OF MERCURY A TEMPERATURE ON THE MORTALITY RAINBOW TROUT,
Battelle-Pacific Northwest Labs., Richla Wash. Ecosystems Dept.
T. O. Thatcher.
In: CONF-730505, Proceedings of a symposi held at Augusta, Georgia May 3-5, 1973. p 54-5 fig, 4 ref.

Descriptors: *Temperature, *Mercu *Resistance, *Rainbow trout, Juvenile fish, Bio say, *Chemical wastes, Water pollution effec *Mortality, Thermal pollution.
Identifiers: Chemical pollutants.

Goals were to define and quantify the combi action of various water temperatures and potent chemical pollutants on fish. Mercury was select as the pollutant and juvenile rainbow trout as t experimental animal. Fourteen continuous flo through bioassays were conducted. A two to thr fold difference in resistance to the mercury w observed, depending on the temperature to whi the fish was exposed. After all fish had been acc mated to 10 C, those at 15 C were more resista than those at 10 C or 20 C. (See also W76-020 (Chilton-ERDA-HNL)
W76-02005

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CIDENCE AND CAUSE OF GAS-BUBBLE EASE IN A HEATED EFFLUENT,
rth Carolina Wildlife Resources Commission, eigh.
W. Miller.
CONF-730505, Proceedings of a symposium d at Augusta, Georgia May 3-5, 1973. p 79-93, 3 8 tab, 15 ref. Dingell-Johnson Project F-19.

scriptors: *Heated water, *Gases, *Nitrogen, persaturation, *Fish, Diseases, Suckers, Sunfes, Bass, *North Carolina, Water sampling, rmal pollution, Water pollution effects, Water lution sources.
ntifiers: Symptoms, *Gas-bubble disease, Lake rman(NC).

h samples were collected monthly from the ted effluent of Marshall Steam Station on Lake rman, North Carolina from November 1971 to y 1972. Of the twenty-one species of fish cap-ed, nine species exhibited external symptoms gas-bubble disease such as popeye of one or h eyes and gas bubbles in the fins. The disease s most prevalent in redhorse suckers (28.6 per-t), white bass (27.8 percent), white crappies 0 percent), and redbreast sunfish (13.0 per-t). Monthly percent incidence for all fish cap-ed peaked at 4.7 percent in February. Water mples taken at the time of the fish sampling pro-m showed that heating of the intake water sed the condenser releases to be supersatu-ed with dissolved gases, particularly nitrogen. e conclusion is that the dissolved gas supersatu-on in the discharge canal and receiving cove sed the observed symptoms of gas-bubble dise in the fish. (See also W76-02004) (Chilton-DA-HNL)
6-02006

NERGISTIC EFFECTS OF TEMPERATURE D OTHER ENVIRONMENTAL PARAMERS ON ORGANISMS,
uth Carolina Univ., Columbia. Belle W. Baruch astal Research Inst.
. Vernberg, and W. B. Vernberg.
CONF-730505, Proceedings of a symposium d at Augusta, Georgia May 3-5, 1973. p 94-99, 3 11 ref.

scriptors: *Temperature, *Salinity, *Oxygen, nvironmental effects, Animal physiology, owth stages, Larval growth stage, Water pollun effects, Thermal pollution.
ntifiers: *Physiological responses, Man-made tors, Chemical pollutants, Fiddler crabs, Zoeal ges.

e effects of two- and three-factor variations in h normal and manmade environmental condins on various physiological responses of fiddler bs were studied. Species from tropical and temate zones were studied under varying condins of temperature, salinity and oxygen concention. Resistance to thermal and salinity stresses ies among different zoeal stages. Mercuric oride was added to test chambers to study addinal environmental stress from man-induced facs. Under optimum thermal and salinity condins, the addition of sublethal concentrations of rcuric chloride produced different metabolic ponses in male fiddler crabs, female fiddler bs, and larval fiddler crabs. (See also W76-04) (Chilton-ERDA-HNL)
6-02007

TCHING SUCCESS OF BLUEBACK-HERNG AND STRIPED-BASS EGGS WITH VARIS TIME VS. TEMPERATURE HISTORIES,
ns Hopkins Univ., Baltimore, Md. Chesapeake y Inst.
R. Schubel, and A. H. Auld.
CONF-730505, Proceedings of a symposium d at Augusta, Georgia May 3-5, 1973. p 164-170, g, 1 tab, 5 ref.

Descriptors: *Temperature, Time, *Hatching, *Herrings, Aquatic animals, *Bass, Larvae, Mortality, Fish eggs, Thermal pollution, Water pollution effects, Fish stocking.

A model plant was constructed to simulate the time versus temperature histories experienced by planktonic organisms at a power plant with a once-through cooling system. Blueback herring eggs in the 4- and 8-cell stages and in the late-embryo tail-free stage and striped-bass eggs in a late-gastrula stage were studied. The length of time for cooling back to average water temperature in the spawning grounds ranged from 30 minutes to nearly 6 hours. Absolute hatching success of experimental herring eggs was 10 to 14 percent less than in the control eggs. Absolute hatching success of experimental striped-bass eggs was 2 to 8 percent lower than those of control eggs. Microscopic examination of eggs and larvae from each experimental and control subsample failed to produce any morphological or behavioral evidence, other than higher mortalities, of abnormal development. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02008

EFFECTS OF A THERMAL EFFLUENT ON THE AMERICAN OYSTER,
Delaware Univ., Lewes. Coll of Marine Studies.
J. C. Tinsman, and D. L. Maurer.
In: CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 223-236, 7 fig, 33 ref.

Descriptors: *Environmental effects, *Thermal water, *Oysters, *Mortality, *Weight, Temperature, Metabolism, Reproduction, Growth rates, Resistance, Parasitism, Disease resistance, *Delaware, *Thermal pollution, Water pollution effects.
Identifiers: Crassostrea virginica, Indian River Bay(Del).

Oysters were placed in three locations in Indian River Bay, Del.: (1) at the intake canal of a fossil-fuel power plant, (2) 2.5 km downstream at the mouth of the effluent canal, and (3) 6 km downstream from the plant. Stations 1 and 3 served as control stations and Station 2 as the test site. Oysters in the heated effluent increased in shell growth because of an extension of the growing season. Meat weights and oyster condition were low during warm months. Favorable winter conditions in the effluent allowed weight and body conditions to improve and exceed the weight and body condition of oysters from the control stations. Oysters held in the effluent showed an increased rate of meat growth throughout the study. The data provide a basis for further studies of thermal effects on disease, parasitism, excessive fouling and spawning of the oyster. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02009

GROWTH AND DEVELOPMENTAL RESPONSES OF LARVAL TOAD POPULATIONS TO HEATED EFFLUENT IN A SOUTH CAROLINA RESERVOIR,
Savannah River Ecology Lab., Aiken, S.C.
D. H. Nelson.
In: CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 264-276, 2 fig, 4 tab, 24 ref. AEC AT-38-1(310).

Descriptors: *Toads, *Larvae, *Growth rates, Embryonic growth stage, *Heated water, Mortality, Thermal stress, *South Carolina, Seepage, Reservoirs, Nuclear powerplants, *Thermal pollution, Water pollution effects.
Identifiers: Bufo terrestris, Anurans, Savannah River Plant(SC).

Toad larvae were laid in cooler parts of a reservoir receiving lethal levels of heated effluent from a nuclear production reactor. Larvae were removed at weekly intervals for a comparison of growth and developmental rates in different thermal regimes under natural conditions. The cooling effect of shoreline seepage allowed successful breeding and development in restricted parts of the reservoir. High mortality of toad eggs and embryos occurred in heated sections of the reservoir. Larval growth and development is more rapid in warmer areas which are within the ranges of thermal tolerance but larval Bufo terrestris grow to a larger size at cooler temperatures. Constantly elevated temperatures prevent anurans from benefiting from the reduced thermal levels associated with nocturnal breeding. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02010

PLANKTON ENTRAINMENT BY THE CONDENSER SYSTEMS OF NUCLEAR POWER STATIONS ON LAKE ONTARIO,
State Univ. of New York at Buffalo. Dept. of Biology.
J. F. Storr.
In: CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 291-295, 4 ref.

Descriptors: *Entrainment, *Plankton, *Thermal stress, *Mortality, *Lake Ontario, Intakes, Discharge, Nuclear powerplants, Temperature, Condensers, Thermal pollution, Water pollution effects.
Identifiers: *Motility, Mechanical stress, Robert Emmett Ginna Nuclear Power Plant, Nine Mile Point Nuclear Station.

Entrainment studies to assess the effects of thermal and mechanical stress on plankton have been carried out at two nuclear power stations on Lake Ontario. Samples of plankton populations were obtained from the intake and discharge after passage through condenser tubes. Motility was used as the indicator of living organisms. Counts were made immediately after obtaining the samples; at the equilibration of the temperatures; and after a 24 hour interval. Temperature difference at the two stations was approximately 7C and the mean mortality of the plankton at the two stations was 18.3 percent and 25.5 percent. Latent mortality was not significant at either station after a 24 hour interval. Experiments showed that temperatures below 35C show no correlation between temperature and mortality. At temperatures above 35C, mortality increases rapidly with 100 percent mortality occurring at about 40.5C. These studies indicate that within the operational temperature ranges at these two stations, up to 20 percent of the mortality could be attributed to mechanical stress. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02011

FISH BEHAVIOR AT A THERMAL DISCHARGE INTO LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
G. P. Romberg, S. A. Spigarelli, W. Prepejchal, and M. M. Thommes.
In: CONF-730505, Proceedings of symposium held at Augusta, Georgia May 3-5, 1973. p 296-312, 2 fig, 6 tab, 15 ref.

Descriptors: *Thermal water, *Sport fish, *Fish behavior, Trout, Smelt, Behavior, Temperature, *Lake Michigan, Tagging, Creel census, Brook trout, Brown trout, Lake trout, Rainbow trout, Thermal pollution, Water pollution effects.
Identifiers: *Point Beach Nuclear Power Plant, *Alewife, *Echo location, Osmerus mordax, Alosa pseudo harengas, Salvelinus fontinalis, Salmo gairdneri, Salmo trutta, Salvelinus namaycush.

Frequent massive concentrations of fish were observed near the thermal discharge flumes at the Point Beach Nuclear Power Plant. Smelt and alewife represent the greatest numbers of fish,

with the smelt appearing in large schools during April and May and the alewife from May to July. Trout are the most abundant sports fish and are present at the plant throughout most of the year but the greatest concentrations coincide with the spring and fall spawning seasons. Results of a tagging study indicate a continual influx of new fish. Trout species were caught primarily at discharge temperatures below 21 C and non-trout species at warmer temperatures. Although fish often seemed to be concentrated in the discharge flumes, fish locator data from two shut down studies indicate that there was no increase in the concentration of fish in the plume area during plant operation. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02012

BEHAVIORAL THERMOREGULATION OF THE AMERICAN ALLIGATOR,
State Univ. of New York Coll. at Buffalo. Dept. of Biology.
J. R. Spotila.
In: CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 322-334, 4 fig, 40 ref. AEC AT(38-1)-310.

Descriptors: *Reptiles, *Temperature, *Regulation, *Microenvironment, Behavior, Thermal stress, Telemetry, Water loss, Thermometer, Heat flow, Water temperature, Wind velocity, Humidity, Animal behavior.
Identifiers: *Alligators, *Thermoregulation, Climate space, Heat energy exchange, Telethermometer, Thermistor probes.

Body temperatures of two alligators were recorded under seminatural conditions in St. Louis, Missouri, using thermistor thermometers and radiotelemetry. Accurate measurement of external physical factors such as radiation, temperatures, wind speed and relative humidity were used to measure the paths of heat flow between the animal and its environment. The alligators employed thermoregulation by making use of water as a heat sink. In this way they were able to regulate their body temperature near the preferred level of 32 C to 35 C. One alligator which was tethered on land was unable to regulate its body temperature at a tolerable level even by remaining in the shade. One alligator remained partially submerged with its back exposed to the sun, thus operating between the blackbody and full-sun lines of its climate space. Also an alligator can regulate its head temperature at a level above that of body temperature by keeping its head exposed to the sun. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02013

THERMAL EFFECTS ON THE MICROBIOLOGY AND CHEMISTRY OF THE CONNECTICUT RIVER-A SUMMARY,
Connecticut Univ., Noank. Marine Research Lab.
J. S. Rankin, J. D. Buck, and J. W. Foerster.
In: CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 350-355, 14 ref. Federal Water Quality Act. US Dept. of Interior 14-12-77.

Descriptors: *Thermal water, *Environmental effects, *Physiochemical properties, *Microorganisms, Connecticut, *Connecticut River, Temperature, Hydrogen ion concentration, Salinity, Dissolved oxygen, Nitrogen compounds, Phosphates, Chemical analysis, Seasonal, Enteric bacteria, Anaerobic bacteria, Thermophilic bacteria, Thermal pollution, Water pollution effects.
Identifiers: *Haddam Neck Plant, Mesophiles, Psychrophiles, Proteolytic bacteria, Lipolytic bacteria, Amylolytic bacteria.

The effects of thermal effluent from a nuclear powered electricity generating station on the physical, chemical and microbiological features of a section of the Connecticut River were studied for 27 months before and 21 months after the start of operations. Physical and chemical determinations included temperature, pH, salinity, dissolved oxygen, nitrate-nitrogen, ammonia-nitrogen, total nitrogen, and ortho- and total-phosphate. Quantitative and qualitative determinations of phytoplankton and bacteria were made. No significant differences appeared in the physical and chemical determinations from the prethermal and the thermal periods. The only alterations that could be attributed to the thermal addition were qualitative shifts in population of heterotrophic mesophilic bacteria and phytoplankton and an increase in the standing crop of certain microalgae in the immediate mixing zone of effluent and the river itself. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02014

RESPONSE OF PERCH AND THEIR FORAGE TO THERMAL DISCHARGES IN LAKE ONTARIO,
State Univ. of New York at Buffalo. Dept. of Biology.
J. F. Storr, and G. Schlenker.
In: CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 363-370, 6 ref.

Descriptors: *Water temperature, *Discharge, Thermal water, *Yellow perch, *White perch, *Lake Ontario, Tagging, Gill nets, Food abundance, Waves(Water), Thermal pollution, Water pollution effects.
Identifiers: Roccus americanus, Perca flavescens, Robert Emmett Ginna Nuclear Power Plant, Nine Mile Point Nuclear Station, Gammerids.

Distributional patterns of fish fauna around discharges of two nuclear power stations on Lake Ontario employing once through cooling are discussed. Tendencies of white perch (Roccus americanus) and yellow perch (Perca flavescens) to be attracted to or discouraged from inhabitating areas adjacent to the outflows under varying operational seasonal conditions are indicated. Attraction to the discharges can be attributed to protection from prevailing wave activity; increase in food supplies (specifically, increase in gammarids); residence of forage fish in the area; and temperature preferendums for prey species. When temperatures in the open lake and the outflow increase, the yellow perch avoids the warmer water of the discharge. Although evidence indicates that thermal outflows are attractive at certain times, a fish tagging program showed that normal fall migration away from the lakeshore to distant spawning areas does occur. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02015

GROWTH OF SALT MARSH MICROCOSMS SUBJECTED TO THERMAL STRESS,
City Univ. of New York. Dept. of Biology.
N. M. Saks, J. J. Lee, W. A. Muller, and S. H. Tietjen.
In: CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 391-398, 2 fig, 2 tab, 22 ref.

Descriptors: *Temperature, *Laboratory tests, *Algae, *Salt marshes, *Growth rates, Microorganisms, *New York, Benthic fauna, Nematodes, Resistance, Thermal stress, Thermal pollution, Water pollution effects.
Identifiers: Euplotes vannus, Allogromia laticollaris, Chromadorina germanica.

Laboratory studies were conducted to determine the thermal tolerance ranges of twelve species of algae which serve as food for meiofaunal species in New York salt marshes. The thermal tolerance ranges of the twelve species varied widely. As temperature increases from 10 C to 25 C, competitive effects become apparent and blooms of particular species are conspicuous. The time for growth inhibition of the species studied at acute temperature stress of 40 C varied from fifte minutes to one hundred ninety five minutes. C timum growth temperatures for the twelve spec ranged from 25 C to 29 C. (See also W76-020 (Chilton-ERDA-HNL)
W76-02016

BIOLOGICAL MONITORING IN WHEEL RESERVOIR BEFORE OPERATION BROWNS FERRY NUCLEAR PLANT,
Tennessee Valley Authority, Muscle Shoals, A Div. of Environmental Planning.
M. P. Taylor.
In: CONF-730505, Proceedings of a symposiu held at Augusta, Georgia May 3-5, 1973. p 399-4 9 fig, 2 tab, 5 ref.

Descriptors: *Tennessee River, *Water quali *Baseline studies, *Bioindicators, *Benthic fau *Zooplankton, *Phytoplankton, Monitoring, D collections, Seasonal, Clams, Midges, Mayflies.
Identifiers: Brown's Ferry Nuclear Plant, C bicula manilensis, Chironomidae, Hexage bilineata.

A four year study provides a data base for chara terizing selected biota along a thirty mile reach the Tennessee River extending above and bel the Brown's Ferry Nuclear Plant. The princip application of the data is to be as a comparison biological conditions before and after the pla begins operation. Benthos and plantkon sampl were collected randomly on a quarterly sampli basis from twenty four points in eight transec Each species was analyzed separately because its variability in different seasons and years, d tribution, and longevity. In the benthic fauna, C bicula showed no extreme effects from seaso changes and therefore serves as a good indicat of long-term trends in water quality. Hexage and Chironomidae did show seasonal effects. Bo phytoplankton and zooplankton exhibit noticeab seasonal variations. (See also W76-020 (Chilton-ERDA-HNL)
W76-02017

EFFECTS OF THERMAL EFFLUENTS ON FIS AND INVERTEBRATES,
Aquinas Coll., Grand Rapids, Mich. Dept. Biology.
R. S. Benda, and M. A. Proffitt.
In: CONF-370505, Proceedings of a symposiu held at Augusta, Georgia May 3-5, 1973. p 438-44 6 tab, 9 ref.

Descriptors: *Thermal water, *Fis *Invertebrates, *Environmental effects, Temper ture, Turbidity, Oxygen, *Sunfishes, Bas *Diptera, Rivers, *Indiana, Caddisflies, Mayflie Thermal pollution, Water pollution effects.
Identifiers: *Plume configuration, Shocking, Lo gear sunfish, Bluegill, White crappie, Spott bass, White River(Ind), Lepomis megloti Micropterus punctulatus, Lepomis macrochiru Pomoxis anularis, Glyptotendipes lobiferus.

A 2 year study on the effects in the White River Petersburg, Ind. of a thermal effluent from an I dianapolis Power and Light Company plant described. With two units operating, the plant normal output is about 640MW. The temperatu increment between the intake and the discharge 20F and the cooling water flow rate is about 67 cu. ft. per sec. Studies revealed that heated wat does not affect growth in length of longear sun ish, spotted bass, bluegill, and white crappie. Th centrarchids in the heated sections were fewer i number per hectare and had a higher average co dition factor than those in the unheated sectio Fish were attracted to the heated discharge in col months but were repelled during hot months a temperature tolerance levels were reached fo each species. Thermal effluent traveling across th river did not create a barrier to migrating fis Heated water depressed the populations of cad disfly larvae, mayfly nymphs, and other inve

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ates in the discharge area when temperatures ed from 88F to 103F but they recovered less 1800 ft. below the discharge. Chironomids e the most frequently collected invertebrates ne heated section; they were not numerous in unheated section. (See also W76-02004) lton-ERDA-HNL)
-02018

OLOGICAL BASE-LINE STUDY OF THE H OF THE ANCLOTE ANCHORAGE,
versity of South Florida, St. Petersburg, Fla.
. Rolfes, A. Feinstein, R. A. Dietz, D. M.
iken, and R. C. Baird.
CONF-730505, Proceedings of a symposium at Augusta, Georgia May 3-5, 1973. p 448-461, , 2 tab, 15 ref.

criptors: *Fish, *Baseline studies, *Fish popu-ons, Data collections, Dicernal, Seasonal, rida, Habitats, Sampling.
ntifiers: *Patterns, *Species diversity, ecies density, Anclote River(Fla).

Anclote Fish Project is part of a study to er base line data in the area of a fossil fuel er plant under construction on the west coast lorida. Four permanent stations were sampled nthly using a multigear sampling strategy. Data cate that patterns of seasonal, diurnal and itat variation in density, diversity, and com-ition are important ecological characteristics of ine inshore fishes. (See also W76-02004) ilton-ERDA-HNL)
6-02019

SPIRATION AND NET PRODUCTIVITY OF E PLANKTON COMMUNITY IN A REAC-R COOLING RESERVOIR,
Pont de Nemours (E. I.) and Co., Aiken, S.C. annah River Lab.
. Tilly.
CONF-730505, Proceedings of a symposium d at Augusta, Georgia May 3-5, 1973. p 462-474, b, 4 fig, 18 ref. AEC AT(07-2)-1.

scriptors: *Thermal water, *Respiration, oductivity, *Plankton, Environmental effects, ton, Reservoirs, Depth, Surface waters, uth Carolina, Biological communities, Thermal lution, Water pollution effects, Cooling water.
ntifiers: *Net productivity, Savannah er(SC).

e influence of heat on the respiration and net ductivity of a plankton community near the rmal discharge of the Savannah River Plant, ken, S.C. is studied. Results of net productivity dies show a tendency for the warm station to be re productive than the cool station and that this dency increases from winter to summer. Max-um productivity also occurs at a shallower th at the warm station. Respiration per unit ight of the seston was unexpectedly found to be ater at the cool station year around. Although th profiles indicated increases in near-surface es, primary productivity per unit area was less luenced by the thermal effluent than was piration because of an offsetting decrease in bon fixation with depth at the warm station. e also W76-02004) (Chilton-ERDA-HNL)
6-02020

TAL METABOLISM OF THERMALLY AF-CTED COASTAL SYSTEMS ON THE WEST AST OF FLORIDA,
rida Univ., Gainesville. Dept. of Environmen-Engineering Sciences.
H. B. Smith, H. McKellar, D. L. Young, and E. Lehman.
CONF-730505, Proceedings of a Symposium d at Augusta, Georgia May 3-5, 1973, p 475-489, ab, 4 fig, 13 ref.

Descriptors: *Thermal water, *Metabolism, *Respiration, *Photosynthesis, *Estuarine environment, Oxygen demand, Canals, Bays, *Florida, Ecosystems, Thermal pollution, Water pollution effects.
Identifiers: *Crystal River(Fla).

The diurnal oxygen curve method was used to measure total community metabolism at Crystal River Power Plant on Florida's west coast. Mean summer values of both net daytime photosynthesis and night respiration in the bay systems were about 4 to 5 grams oxygen per square meter per day. Winter values were generally one-half to one-third the summer values. No significant difference between affected and control areas was demonstrated. The photosynthesis-respiration ratios were near 1 in the summer and dropped below 1 in the winter. Studies on total metabolism measurements in the intake and discharge canals of the power plant indicated that photosynthesis-respiration ratios ranged from 0.02 to 0.50. During October, the net daytime production in the discharge canal was 80 percent lower than in the intake canale while nightime respiration was five times higher. During February total metabolism in both canals was 50 percent lower. The 124 acres canals produced 70 to 75 percent less oxygen than the same area of bay ecosystem and respired about 1.5 times more oxygen than the same area of bay. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02021

INFLUENCE OF TEMPERATURE ON THE PHOTOSYNTHETIC EFFICIENCY IN NATURAL POPULATIONS OF MARINE PHYTOPLANKTON,
Massachusetts Univ., Glouchester. Marine Station.
C. S. Yentsch, C. M. Yentsch, L. R. Strube, and I. Morris.
In: CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973, p 508-517, 6 fig, 11 ref. AEC AT(11-1)3024, NSF GA 29501.

Descriptors: *Temperature, *Photosynthesis, *Phytoplankton, *Aquatic populations, Seasonal, Measurements, Growth rates, Curves, Marine plants.
Identifiers: *Acclimatize, Photosynthetic efficiency, *Gulf of Maine.

The photosynthesis versus temperature relationships of natural populations of the Gulf of Maine were examined. The seasonal temperature cycle ranges from approximately -1.5C to 18C. Seasonal phytoplankton growth is characterized by low populations in winter, a spring bloom, and smaller blooms during the summer. Phytoplankton photosynthesis was maximum between 14 and 17C. The water temperature at the time of sampling ranged from 2.3C to 17.3C. Data indicate that populations were not adapted to water temperatures. A curve describing the relationships between temperature and photosynthetic efficiency was derived from data points. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02022

EFFECT OF THERMAL EFFLUENTS ON THE MARINE BIOLOGY OF SOUTHEASTERN FLORIDA,
Miami Univ., Fla. Dept. of Microbiology.
A. Thorhaug.
In: CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973, p 518-531. 7 fig, 16 ref.

Descriptors: *Heated water, *Marine algae, *Marine plants, *Estuaries, On-site investigations, Laboratory tests, Biological communities, Ecosystems, *Florida, Thermal pollution, Water pollution effects.
Identifiers: *Turtle grass, *Macroalgae, Biscayne Bay(Fla), Card Sound(Fla), Thalassia testudinum, Green algae, Penicillus capitatus, Halimeda incrassata, Rhipocephalus phoenix, Udotea flabellum, Avrainvilla, Red algae, Laurencia poitei.

Results are presented of a three year field and laboratory investigation on the effects of heated effluents from fossil-fuel and nuclear power plants discharged into shallow estuaries of Biscayne Bay and Card Sound. At temperatures 3 to 4 C above ambient the Thalassia community declined by about 50 percent and macroalgae fell to about 30 percent of the former population resulting in an overall loss of nutrients. In 1972, changes in the effluent pumping system caused production increase of Thalassia of 40 percent in areas where the heating was lowered but production farther out in the bay declined as the increased volume flow caused the effluent plume to extend further into midbay. Mean standing crops for algae show temperature dependence. Data indicate that maximum standing crop of the seven major species occurred at 30 to 31 C. None of the important macroalgae survived above 34 C. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02023

STUDIES OF FLORIDA GULF COAST SALT MARSHES RECEIVING THERMAL DISCHARGES,
Florida Univ., Gainesville, Fla. Dept. of Environmental Engineering Sciences.
D. L. Young.
In: CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973, p 532-550. 5 fig, 4 tab, 26 ref.

Descriptors: *Heated water, *Salt marshes, *Metabolism, *Productivity, *Respiration, Ecosystem, Water temperature, Seasonal, Snails, Animal populations, *Florida, Thermal pollution, Water pollution effects.
Identifiers: *Spartina alterniflora, Littorina irrorata, Uca, Fiddler crabs, Crystal River.

A salt marsh receiving thermal effluents from an electricity-generating station and two marshes not receiving thermal additions were studied. Indexes of overall community structure and metabolism were chosen to evaluate the effect of thermal discharges. Monthly harvest samples of Spartina standing crop, in-situ infrared gas analysis measurements of metabolism, and litter-bag experiments were undertaken to investigate the effect of effluents on standing crop and net production, respiration and total metabolism and decomposition. Water temperatures in the thermally affected marsh averaged 3-6C warmer than in the control marshes. The apparent net production calculated was 547 gms. per sq. meter(dry weight) in the thermal marsh and 282 gms. per sq. meter(dry weight) in the control marsh. Community metabolism measurements indicated community respiration in the thermally affected marsh to be twice that in the control marsh. Population comparisons of snails and fiddler crabs were made. Snails showed no difference in numbers but crabs were less numerous in the thermally affected marsh. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02024

POTENTIAL USE OF VEGETATION TO ENHANCE COOLING IN HOLDING PONDS,
California State Univ., San Diego. Dept. of Biology.
P. C. Miller.
In: CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973, p 610-627. 5 fig, 2 tab, 28 ref.

Descriptors: *Heat transfer, *Mangrove swamps, *Model studies, *Canopy, Vegetation, Cooling, Heated water, Resevoirs, Solar radiation, Surfaces, *Florida, Water vapor, Thermal pollution, Water pollution.
Identifiers: *Leaf Area Index.

A simulation model was used to study the transport of heat and water vapor through mangrove canopies in cooling ponds in south Florida. Simulations with the model using realistic water flow rate and extreme environmental conditions indicated that if the vegetation were left intact the natural environment would be much less affected and the water would cool to ambient before recycling through the power plant. Carbohydrate production in the canopies and transfer of heat and water vapor from the surface are dependent upon Leaf Area Index of the canopy. The mangroves are expected to experience increased, but not severely detrimental, water stress owing to the hot water. (See also W76-02004) (Chilton-ERDA-HNL)
W76-02025

TIDAL FLATS IN ESTUARINE WATER QUALITY ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
D. A. Bella.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/3-75-025, June 1975. 184 p, 37 fig, 19 tab, 89 ref, append. EPA-660/3-75-025. 1BA025. Grant 16070 DGO.

Descriptors: Estuaries, *Estuarine environmental, Ecosystems, Water quality, *Tidal hydraulics, *Sulfates, *Mixing, Path of Pollutants, Ecology, Water pollution effects, Simulation analysis, *Sulfides, Toxicity., *Benthas.
Identifiers: Yaquina Estuary(Ore).

The initial phases of the study involved mixing processes and tidal hydraulics; however, the study emphasis shifted to estuaries benthic systems as the importance of these systems became more apparent. A conceptual model of estuarine benthic systems was developed and a classification system of estuarine benthic deposits which is based on the availability of hydrogen acceptors and reactive iron was developed. Field studeis demonstrated that estuarine sediments and overlying wastes could contain significant concentrations of free sulfides which are toxic to a variety of organisms. Field studies of benthic oxygen uptake and benthic sulfide release were conducted. Water quality profiles within the deposits also were determined. A number of laboratory studies were conducted to determine the rate of sulfate reduction. Results from experiments using extracts from benthic deposits and algal mats demonstrated a close relationship between the rate of sulfate reduction and the sulfate and soluble organic carbon concentrations. A general systems model of estuarine benthic systems was developed. A variety of activities which could contribute to significant environmental changes with estuarine benthic systems were identified. Methods of determining dispersion coefficients from salinity profiles were examined and an improved method was developed. The build-up of a pollutant in the vicinity of the outfall during the slack water period of tide was studied through a field experiment and mathematical model. (EPA)
W76-02071

A SUITABILITY INDEX OF DRAINAGE WATERS FOR IRRIGATION PURPOSES,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
For primary bibliographic entry see Field 3C.
W76-02168

PHOTOSYNTHETIC ACTIVITY OF INDIVIDUAL ALGAL SPECIES OF THE PLANKTON OF LAKE KRIVOYE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
V. N. Nikulina, and B. L. Gutel'makher.
Ekologiya, 5(4): 101-104, Illus, 1974, (In Russian).

Descriptors: *Alagae, *Plankton, *Lakes, Oligotrophy, Arctic, *Cold regions, Biomass, Productivity, *Eutrophication, Photosynthesis.
Identifiers: Asterionella-formosa, Coelosphaerium-kuetzingianum, Cyclotella-comta-var-oligactis, Cyclotella-kuetzingiana, Dactylococcopsis-acicularis, Dinobryon-divergens, Gloeococcus-schroeteri, Gloeothece-confluens, Individual, Krivoye, Lake Melosira-islandica-helvetica, Ochromonas-pallida, Oocystis-borgei, Synechococcus-aeruginosus, USSR.

The results of an investigation of the primary production, species composition, abundance and biomass of algae (Coelosphaerium kuetzingianum, Dactylococcopsis acicularis, Ochromonas pallida, Gloeothece confluens, Cyclotella comta var. oligactis, Synechococcus aeruginosus, Gloeococcus schroeteri, Melosira islandica ssp. helvetica, Asterionella formosa, Oocystis borgei, Dinobryon divergens, Cyclotella kuetzingiana) in oligotrophic Lake Krivnoe (located 30 km from the artic circle near Cape Kartesh (USSR)) are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-02206

SANITARY-VIROLOGICAL STUDY OF SURFACE WATERS, (IN RUSSIAN),
R. Walter-Offenhauer, and K. Horn.
Gig Sanit. 9 p 72-74, 1974.

Descriptors: *Viruses, Surface water, Europe, *Epidemiology, Human diseases, *Public health.
Identifiers: Coxsakievirus, *East Germany, Echovirus, Picornaviruses, Poliovirus, Virological studies.

Various serotypes and concentrations of viruses (polio, Coxsackie A and B, ECHO) were found in all investigated waters in East Germany. The seasonal distribution of the virus-positive water samples indicated a maximum of viruses in the water in June-Aug., which apparently is related to the intensity of the anthropogenic factor. Sanitary-virological investigations of natural waters and epidemiological observations of selected population groups can elucidate mechanisms of spread of virus infections. --Copyright 1975, Biological Abstracts, Inc.
W76-02221

WATER QUALITY CONTROL THROUGH SINGLE CROP AGRICULTURAL, NO 4,
Bemidji State Coll., Minn. Center for Environmental Studies.
For primary bibliographic entry see Field 5G.
W76-02272

EFFECTS OF ENTRAINMENT OF ZOOPLANKTON AT THREE MID-ATLANTIC POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. M. Davies, and L. D. Jensen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 755, $5.00 in paper copy, $2.25 in microfiche. Prepared for Electric Power Research Institute, Cooling Water Discharge Research Project (RP-49), March 1974, 76 p, 49 fig, 24 tab, 48 ref.

Descriptors: *Entrainment, *Powerplants, *Heated water, Movement, *Discharge(Water), *Temperature, *On-site data collections, *Zooplankton, *Cooling water, Aquatic life, Aquatic animals, Aquatic microorganisms, Methodology, Sampling, Chlorination, Chlorine, Analytical techniques, *Thermal pollution, Water pollution effects.
Identifiers: *Motility, Lake Norman(North Carolina), James River(Virginia), Indian River(Delaware).

The passage of zooplankton through the power plants on Lake Norman, North Carolina, James River, Virginia and Indian River Estuar Delaware was studied. Live samples were c lected by means of paired time coordinate pump one for intake and one for discharge. Zooplankt motility was mutually dependent upon temper ture rise through the power plant and intake te perature. At Lake Norman, zooplankton show only minimal damage from entrainment at highe summer temperatures (22 degrees C), but in win suffered 40 to 50 percent decrease in motility wh temperature rise increased from 11 to 20 degre C. Motility of entrained plankton dropped belo 50 percent at James River when intake water te perature exceeded 22 degrees C. At warme summer discharge temperatures (above 27C Lake Norman, 40C at James River, 36C at Indi River) zooplankton were less numerous in sampl from the discharge port than those from the mixi zone. (Katz)
W76-02315

PRODUCTION, DISTRIBUTION, USE AND E VIRONMENTAL IMPACT POTENTIAL O SELECTED PESTICIDES,
Midwest Research Inst., Kansas City, Mo.
R. von Rumker, E. W. Lawless, A. E. Meiners, K A. Lawrence, and G. L. Kelso.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-238 79 $11.75 in paper copy, $2.25 in microfiche. Counc on Environmental Quality, Washington, D C Final Report, MRI Project No 3749-C, 439 March 1974. 57 fig, 43 tab, 6 append, 112 ref. EQ 311.

Descriptors: *Insecticides, *Pesticide *Fungicides, *Fumigants, *Organic compound *Herbicides, Environmental effects, Aldri Diazinon, 2,4-D, Pesticide toxicity, Inhibitor Water pollution effects.
Identifiers: Carbaryl, Carbofuran, Chlordan Disulfoton, Malathion, Methyl parathio Parathion, Toxaphene, Alachlor, Atrazine Bromacil, 2,4-D, MSMA, Sodium chlorate, Triflu ralin, Captan, Creosote, Nameb, Pen tachlorophenol, Methyl bromide Dichlorobenzene, Organotin compounds.

The production, distribution, use patterns, an potential for environmental impacts of pesticide were described, with emphasis on 25 importan pesicides that were selected by applying a priorit rating system to 125 major pesticides. Environ mental impact potential, wasteful use practices and alternative methods for pest control wer discussed in general and in particular for each o the intensive-study pesticides. (Klein)
W76-02316

AGE AND GROWTH OF BLUEGILL, LEPOMIS MACROCHIRUS IN TWO HEATED TEXAS RESERVOIRS,
Texas A and M Univ., College Station. Dept. o Wildlife and Fisheries Sciences.
S. L. Serns, and K. Strawn.
Transactions of the American Fisheries Society, p 506-512, No 3, 1975. 5 fig, 3 tab, 17 ref.

Descriptors: *Growth rates, *Freshwater fish, *Reservoirs, Heated water, Fish physiology, Water quality, Equations, *Sunfishes, Texas, Thermal pollution.
Identifiers: Fish scales, Scale reading, Lake Bastrop(Tex), Lake Nasworthy(Tex).

The method of determining age and growth by scale readings was used for bluegills, Lepomis macrochirus, in two heated reservoirs. Females grew faster in both lakes. Annulus formation occurred from January through July, with no growth from November through January. Growth of bluegills in the two lakes was above that reported in the literature. Length-weight regression equations were determined for bluegills. (Klein)
W76-02318

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DD HABITS OF ICTALURUS NUBULOSUS ACID POLLUTED WATER OF NORTHERN ST VIRGINIA,
t Virginia Univ., Morgantown. Dept. of Biolo-

. Klarberg, and A. Benson.
nsactions of the American Fisheries Society, p 547, No 3, 1975, 6 tab, 17 ref.

criptors: *Bullheads, *Fish food organisms, ochaetes, Detritus, Sewage, Acids, Nutrient irements, Algae, Water quality, Water pollu- effects, Invertebrates, Chironomids, West ginia.
tifiers: Monongahela River(W Va).

d habits of the brown bullhead, Ictalurus nebu-s, were investigated in an acid polluted river compared with a pollution-free pond. ochaetes were the most important inver-ates food source in the river, whereas onomid larvae were the most important inver-ates consumed in the pond. Also consumed in pond was detritus and algae, and sewage in the r. No qualitative difference in food habits was ed between different size groups of fish in er acid or non-acid situations. The brown bull-d was able to meet its nutritional requirements n detritus, sewage, and acid-tolerant inver-ates. (Klein)
6-02319

MMER DISTRIBUTION OF THE ARSHORE FISH COMMUNITY NEAR A ERMAL GENERATING STATION AS TERMINED BY ACOUSTIC CENSUS,
nada Centre for Inland Waters, Burlington ntario); and Fisheries and Marine Service, Ot-a (Ontario). Great Lakes Biolimnology Lab.
primary bibliographic entry see Field 5B.
6-02321

XICITIES OF CRUDE OILS AND OIL-SPERSANT MIXTURES TO JUVENILE RAB-TFISH, SIGANUS RIVULATUS,
tional Marine Water Quality Lab., West King-n, R. I.
Eisler, and G. W. Kissil.
nsactions of the American Fisheries Society, 3, p 571-577, 1975, 6 tab, 13 ref.

scriptors: *Toxicity, *Oil wastes, *Fish, boratory tests, Lethal limit, Salinity, Bioassay, h physiology, Water pollution effects.
ntifiers: *Crude oil, *Oil dispersants, ST5, abbitfish, Bioaccumulation.

xicities were determined for two crude oils (one m the Persian Gulf (Iran) and one from the ai Peninsula), ST5, a chemical oil dispersant, l oil-ST5 mixtures (10:1 ratio) to rabbitfish, anus rivulatus. The LC50 was 0.74 ml/liter for Iranian crude oil, 14.5 ml/l for Sinai crude, and 10 ml/l for oil-ST5 mixtures. Iranian oil became s toxic with increasing time in seawater; the erse was observed for Sinai crude. ST5 ex-ited a dramatic reduction in lethality after 2 urs. Liver enlargement in rabbitfish was linked h exposure to high concentrations of crude oil. gh sublethal levels of ST5 caused reductions in od hematocrit. Rabbitfish survival was highest 30-50% salinity. Rabbitfish were more resistant crudes and oil-dispersant mixtures in continu-s flow bioassays conducted in large tanks than static jar bioassays. (Klein)
76-02322

XICITY OF POTASSIUM PERMANGANATE FISH AND ITS EFFECTIVENESS FOR TOXIFYING ANTIMYCIN,
reau of Sport Fisheries and Wildlife La Crosse, is. Fish Control Lab.
L. Marking, and T. D. Bills.
ansactions of the American Fisheries Society, 3, p 579-583, 1975, 1 fig, 4 tab, 16 ref.

Descriptors: *Toxicity, *Pottasium compounds, *Piscicides, *Antibiotics(Pesticides), *Channel catfish, Freshwater fish, Water quality, Water pollution effects.
Identifiers: Bioaccumulation, Potassium, Permanganate, *Goldfish, *Antimycin, Detoxifying Agent.

The 96-h LC50's for potassium permanganate (KMn04) ranged from 0.75 milligrams/liter with channel catfish, Ictalurus punctatus, to 3.6 milligrams/liter with goldfish, Carcassius auratus, in laboratory tests. The toxicity of KMn04 was greatest in water of lower temperatures in harder water, or in higher pH water. KMn04 was effective for detoxifying the fish toxicant antimycin in waters of pH 6.5-9.5. The half-life for antimycin exposed to 1.0 milligram/liter of KMn04 ranged from 7 to 11 minutes in the different pH waters at 12C.
W76-02323

THE LOWER TROPHIC LEVEL TOXICITY ASSESSMENT IN THE GOLDEN HORN AREA IN ISTANBUL,
Technical Univ. of Istanbul (Turkey). Dept of Engineering and Architecture.
D. Orhon.
Water Research, Vol 9, No 5/6, p 467-472, May/June, 1975, 13 fig, 11 ref.

Descriptors: *Trophic level, *Respiration, *Photosynthesis, *Bioassay, Toxicity, Methodology, Metabolism, Ecosystems, Environmental effects, Metals, Mercury, Lead, Copper, Zinc.
Identifiers: Instanbul, *Turkey.

Toxicity in the Golden Horn estuary was studied by means of lower trophic level bioassays. Respiration and photosynthesis rates of the bioassay communities developed in situ were found to be significant response parameters of the toxicity. Changes in the metabolic responses upon addition of toxic chemicals were evaluated in terms of the toxic potential of these substances, with regard to future ecological balance-pollution problems. (Klein)
W76-02324

THE RELATIONSHIP OF THE 96-HOUR LC50 TO THE LETHAL THRESHOLD CONCENTRATION OF HEXAVALENT CHROMIUM, PHENOL, AND SODIUM PENTACHLOROPHENATE FOR FAT-HEAD MINNOWS (PIMEPHALES PROMELAS RAFINESQUE),
Minnesota Univ., St. Paul. Dept of Entomology, Fisheries and Wildlife.
R. G. Ruesink, and L. L. Smith, Jr.
Transactions of the American Fisheries Society, No 3, p 567-569, 1975, 2 tab, 12 ref.

Descriptors: *Toxicity, *Lethal limit, *Minnows, *Chromium, *Organic compounds, *Phenols, Bioassay, Water quality, Temperature, Water pollution effects.
Identifiers: *Fathead minnows, Bioaccumulation, Hexavalent chromium, *Sodium Pentachlorophenate.

Short-term bioassays were conducted with fathead minnows, Pimephales promelas, and hexavalent chromium, phenol, and sodium pentachlorophenate at 2 temperatures to determine the relationship of the 96-hr LC50 to the lethal threshold concentration. The lethal threshold concentration was less than the 96-hr LC50 in 10 of 12 bioassays, was affected by temperature, and was not a constant multiple of the 96-hr LC50 for any of the toxicants tested. (Klein)
W76-02325

SOME EFFECTS OF STOCKING FISH IN WASTE TREATMENT PONDS,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
G. L. Schroeder.
Water Research, Vol 9, No 5/6, p 591-593, May/June, 1975, 2 tab, 9 ref.

Descriptors: *Fish, *Waste treatment, *Fish stocking, Nutrient removal, Dissolved oxygen, Bacteria, Sewage, Ecosystems, Plankton, Benthic Fauna, Water pollution effects.

The addition of fish to waste treatment oxidation ponds appeared to be an effective means of utilizing plankton and bottom fauna. The fish produced a system that was thought to be better balanced biologically. The results included overall higher dissolved oxygen concentration and higher pH within the pond. The changes improved the effectiveness of a waste treatment pond by reducing BOD and removing nutrients from the water. Bacteria concentrations were as much as 15 times lower in fish stocked treatment ponds as compared with unstocked ponds. (Klein)
W76-02326

FLUX OF CADMIUM THROUGH EUPHAUSIIDS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
G. Benayoun, S. W. Fowler, and B. Oregioni.
Marine Biology, Vol 27, No 3, p 205-212, 1974, 4 fig, 3 tab, 29 ref.

Descriptors: *Cadmium, *Food chains, *Heavy metals, *Absorption, *Path of pollutants, *Zooplankton, *Food webs, *Radioisotopes, *Cadmium radioisotopes, Toxicants, Water pollution sources, Public health, Laboratory tests, Mathematical models, Metals.
Identifiers: Bioaccumulation, Meganyctiphanes norvegica, *Euphausiids, Excretion, Fecal pellets, Tissue analysis.

Flux of the heavy metal cadmium through the euphausiid Meganyctiphanes norvegica was examined. Radiotracer experiments showed that cadmium can be accumulated either directly from water or through the food chain. Experimentation indicates that exchange between cadmium in the water and that in euphausiid tissue is a relatively slow processs and ingestion of cadmium is probably the more important route for accumulation. Approximately 10% of cadmium from radioactive Artemia ingested by euphausiids was incorporated into internal tissues. After one month, cadmium accumulated directly from water was most concentrated in the viscera. From comparisons of all routes by which cadmium can be released from M. norvegica to the water column, it is concluded that fecal pellet deposition represents the principal mechanism effecting the downward vertical transport of cadmium by this species. Fecal pellets accounted for 84% of the total cadmium flux. (Katz)
W76-02327

SURVIVAL AND CHLORIDE ION REGULATION OF THE PORCELAIN CRAB PETROLISTHES ARMATUS EXPOSED TO MERCURY,
Texas A and M Univ., College Station. Dept. of Biology.
G. Roesijadi, S. R. Petrocelli, J. W. Anderson, B. J. Presley, and R. Sims.
Marine Biology, Vol 27, No 3, p 213-217, 1974, 3 fig, 2 tab, 20 ref.

Descriptors: *Mercury, Animal physiology, *Salinity, *Bioassay, *Ion exchange, *Lethal limit, *Ion transport, Chlorides, Invertebrates, Laboratory tests, Aquatic animals, Shellfish, Crustaceans, Water pollution effects, Metals, Regulation, Osmosis.
Identifiers: Survival, Petrolishthes armatus, *Osmoregulation, *Chloride ion regulation, *Sublethal effects, Porcelain crab, Blood analysis.

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Acute toxicity bioassays conducted at various salinities demonstrated that mercury (as mercuric chloride) at low concentrations was lethal to Petrolishthes armatus. Ninety-six hour LC50 values varied from 50 to 64 parts per billion (ppb) of mercury, depending on test salinities. Lower salinities decreased the time to death of mercury-exposed crabs. Differences in survival after 96 hr due to salinity were not statistically significant. Blood chloride concentrations were regulated hyper-chloride to the medium at low salinities and hypo-chloride at high salinities by acclimated crabs. The salinity isochloride to blood was 22% S. Transfer of crabs from 15% S to salinities ranging from 7 to 35% S resulted in new steady-state chloride levels within 12 hr. Exposure to 50 ppb mercury did not alter chloride ion regulation of either accimilated crabs or crabs adjusting to new salinities. (Katz)
W76-02328

CRITICAL THERMAL MAXIMA AND UPPER LETHAL TEMPERATURES FOR THE CALANOID COPEPODS ACARTIA TONSA AND A. CLAUSI,
National Marine Water Quality Lab., West Kingston, R. I.
J. G. Gonzalez.
Marine Biology, Vol 27, No 3, p 219-223, 1974, 3 fig, 26 ref, 1 tab.

Descriptors: *Temperature, *Lethal limits, *Heated water, *Copepods, *Distribution patterns, Resistance, Estuaries, Temperate, Laboratory tests, Methodology, Thermal pollution, Water pollution effects.
Identifiers: Critical thermal maxima, Acartia tonsa, Acartia clausi, *Thermal tolerance, Acclimination, CTM.

Determination of the critical thermal maxima and upper lethal temperatures for Acartia tonsa and A. clausi revealed the relative temperature tolerance of the two species. A. tonsa exhibited a wider range of acclimation temperatures compared with A. clausi which relates to its ubiquity in Atlantic Ocean estuaries, both temperate and tropical, and its capacity to live in temperate waters during most of the year. Differences between upper lethal temperatures and critical thermal maxima were very narrow for A. tonsa from tropical and subtropical areas. This suggests that, in warm climates, this copepod lives close to its upper thermal temperature limits. (Katz)
W76-02329

COMPARATIVE TOXICITY OF LARVAL LAMPRICIDE (TFM: 3-TRIFLUOROMETHYL-4-NITROPHENOL) TO SELECTED BENTHIC MACROINVERTEBRATES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Maki, L. Geissel, and H. E. Johnson.
Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1455-1459, August 1975, 2 tab, 12 ref.

Descriptors: *Benthos, *Invertebrates, *Crustaceans, *Marine insects, *Organic compounds, *Toxicity, Lethal limit, Crayfish, Mayflies, Dragonflies, Dobsonflies, Animal physiology, Growth cycles.
Identifiers: Larval lampricides, TFM, *Bioaccumulation, 3-trifluoromethyl-4-nitrophenol, Tissue analysis, Blackfly, Simulium pugetense, Orconectes propinquus, Chauloides sp, Ophigomphus sp, Ligumia sp, Ephemerella cornuta.

The acute toxicity of larval lampricide (TFM: 3-trifluoromethyl-4-nitrophenol) to 35 species of benthic macroinvertebrates was determined in 96-h flow-through tests. The 96-hr LC50 values range from 2.1 mg/liter for blackfly larvae, Simulium pugetense, to value s in excess of 38.0 mg/liter for species with heavy exoskeletons: crayfish (Orconectes propinquus), dobsonfly larvae (Chauloides sp), and dragonfly naiads (Ophiogomphus sp). Younger individuals of the clam (Ligumia sp) and the mayflay nymph (Ephermerella cornuta) were 2 to 1.5 times more sensitive than larger individuals of the same species. Early emergence of adults and increased locomotor activity were observed among some organisms exposed to sublethal concentrations. (Klein)
W76-02330

UPTAKE OF MERCURY BY FRESHWATER CLAMS (FAMILY UNIONIDAE),
Manitoba Univ., Winnipeg. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W76-02331

ISOLATION AND IDENTIFICATION OF CONSTITUENTS TOXIC TO JUVENILE RAINBOW TROUT (SALMO GAIRDNERI) IN CAUSTIC EXTRACTION EFFLUENTS FROM KRAFT PULPMILL BLEACH PLANTS,
B. C. Research, Vancouver, (British Columbia).
For primary bibliographic entry see Field 5A.
W76-02332

HEAT EFFECTS ON A MARINE SNAIL,
Chicago Univ., Ill. Dept. of Zoology.
R. J. Hamby.
Biological Bulletin, Vol 149, No 2, p 331-347, October 1975, 5 fig, 3 tab, 35 ref.

Descriptors: *Snails, *Temperature, Animal physiology, Water quality, Analytical techniques, *Thermal pollution, Water pollution effects.
Identifiers: *Littorina littorea, *Nervous system, Tissue analysis, Acclimation.

Littorina littorea was found to be capable of coping with long-term and short-term changes in environmental temperature. Measurements of spontaneous activity of the central nervous system of the snails showed good agreement between temperature of cessation of spontaneous activity and temperature of heat coma in 5C and 25C acclimated snails. Analysis of nervous activity showed that increase in activity with rising temperature was based upon both a greater frequency of firing of single units and activation new units. Single unit frequency appeared to show no acclimation effect except in the temperature of cessation of activity. (Klein)
W76-02333

EFFECTS OF HYPOXIA ON THE BREATHING RATE, HEART RATE AND RATE OF OXYGEN CONSUMPTION IN FISHES,
Kyushu Univ., Fukuoka (Japan).
T. Nakanishi, and Y. Itzawa.
Report of Fishery Research Laboratory, Kyushu University, No 2, p 41-52, 1974, 20 fig, 20 ref.

Descriptors: *Fresh water fish, *Marine fish, *Respiration, *Oxygen demand, *Fish physiology, Rainbow trout, Carp, Eeels, Methodology, Water quality, Environmental effects, Water pollution effects.
Identifiers: Heart rate, *Hypoxia, Salmo gairdneri, Cyprinus carpio, Anguilla japonica, Chrysophrys major, Sebasticus marmoratus, Sebastes inermis.

Breathing rate, heart rate and rate of oxygen consumption were highest in the rainbow trout, lowest in the Japanese eel, and intermediate in the carp, among the three freshwater fishes. Breathing rate was highest in the sea bream, lowest in a rockfish, Sebasticus, and intermediate in another rockfish, Sebastes, among the three marine fishes. These orders were considered to coincide with the orders of their activity. Thermal coefficient, Q10, between 11.4 degrees C and 23.9 degrees C was 1.60 in breathing rate and 1.47 in heart rate of the eel. Breathing rate and heart rate showed adju mental changes during hypoxia. Rate of oxyg consumption showed a recovery from the init decrease at the stage of markedly increased ve tilation and decreased at extreme hypoxia. Chan of breathing rate and heart rate by hypoxic cond tion in the eel occurred at higher saturation of o ygen at higher temperature. Oxygen residue hypoxic death was lowest in the eel, highest in t rainbow trout, and intermediate in the carp. Th order was considered to coincide with the order resistability of the fishes to poor oxygen conditio (Katz)
W76-02334

THE EFFECTS OF PESTICIDES ON BRITIS WILDLIFE,
S. Cramp.
Br Vet J. Vol 129, No 4, p 315-323, 1973. Illus.

Descriptors: *Pesticides, Pesticide residue *Wildlife, *Birds, Aldrin, *Chlorinated hydroca bon pesticides, Dieldrin, Insecticides, Lethal lim Water pollution effects, Polychlorinated biphe yls.
Identifiers: *Great Britain.

The effects of pesticides on wildlife, especial birds, in Britain, are relatively well documente The main danger is from pesticides such as the o ganochlorines, which persist and accumulate species at the ends of food chains. The 1st bi casualties occurred in the early 1950's, a became severe later in the decade with the i troduction of aldrin and dieldrin seed dressing These mass kills largely ceased after voluntar restrictions were agreed in 1961 and disquiet w then caused by the declines in certain birds prey. These were due to sublethal effects on fe tility including the laying of thin eggshells a direct mortality. There was a slight recovery, fo lowing further restrictions on organochlorine from 1966. High pesticide residues (and in 1 sp cies, thin eggshells) were reported in fish eati birds of freshwater and marine habitats, but n clear link between population declines in some these and pesticides was established. The positio is complicated, especially for seabirds, by oth marine pollutants, such as oil and polychlorinate biphenyls. For most other birds, and mammal knowledge of population trends is limite Although deaths have occurred there is n evidence of lasting effects on numbers. The valu of wild life to indicate possible damage by enviro mental pollutants is stressed.--Copyright 197 Biological Abstracts, Inc.
W76-02343

EVALUATING A MATHEMATICAL MODEL FOR PREDICTING LAKE EUTROPHICATION,
Virginia Univ., Charlottesville. Dept. of Enviro mental Sciences.
G. M. Hornberger, M. G. Kelly, and T. C. Lederman.
Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-248 04 $5.50 in paper copy, $2.25 in microfiche. Virgini Water Resources Research Center, Blacksburg VPI-WRRC Bulletin 82, September 1975. 102 p, fig, 6 tab, 50 ref, 2 append. OWRT A-045-VA(2).

Descriptors: *Mathematical models, Testing Evaluation, Ecosystm, *Model studies *Eutrophication, Lakes, Ecology, Environmenta effects, *Forecasting, Nutrients, Phytoplankton Computer models, *Growth rates, Water pollutio effects.
Identifiers: *Predictive models, Species diversity *Lakes ecosystem models.

This research project developed a mathematica model of a lake ecosystem and then tested its abili ty to indicate what ecological changes-in particula eutrophication-would result from changes in the physical environment. The model was developed using a digital computer. In situ enrichment experi

than were performed to assess the relation-
between nutrient concentrations and the
h of phytoplankton. The investigation in-
d an evaluation of the use of non-linear
ieter estimation in determining the model's
h constants. The model did demonstrate that
uld provide useful qualitative information.
experiments did not, however, produce data
le for quantifying the relationship between
es diversity and nutrient addition showed that
ersity index holds little promise for use as a
itative indicator of eutrophic conditions. The
experiments and the study of parameter esti-
n indicate that in situ enrichment experi-
will not provide adequate data for accurate
mination of model parameters. Growth
ieters can be estimated on the basis of care-
boratory experiments, but extrapolation of
ata to field conditions proved questionable.
his reason and others, the principal applica-
of lake ecosystem models is for qualitative
minations. Even for this limited use, each
l must be carefully designed for each specific
cation.
02370

ICITY STUDIES OF PHOTO-FILM
TES,
ral Public Health Engineering Research Inst.,
ur (India).
Krishnamoorthi, W. M. Deshpande, and G.
hanrao.
n Journal of Fisheries, Vol 18, No 1 and 2, p
, 1971. 9 tab, 4 ref.

riptors: *Industrial wastes, *Toxicity,
shwater fish, *Water quality, Organic com-
ds, Bioassay, Sulfates, Ammonia, Water pol-
n effects, Water pollution sources.
ifiers: *Barbus ticto, *Rasbora daniconius,
accumulation, *Photo-film industry,
roquinone, Metol.

photo-film industry discharged three fish
waste types. The effluents in descending
r of toxicity were the laboratory effluent, the
sion wash water, and the white water. Toxici-
the emulsion wash was primarily due to the
ssociated ammonia. Laboratory effluent tox-
was primarily due to hydroquinone and metol
h showed synergistic effects. Thiosulphate
carbonate and to a much smaller extent
iate had antagonistic effects on the toxicity of
oquinone and metol. Coagulation with alu-
um sulphate and settling reduced the toxicity
e wastes considerably. (Klein)
-02386

LIFERATIONS IN THE FISH EPIDERMIS
ER TREATMENT WITH GLYCOLYSIS IN-
ITORS, (PROLIFERATIONEN DER
EPIDERMIS NACH DER EINWIRKUNG
INHIBITOREN DES GLYKOLYTISCHEN
RGIESTOFFWECHSELS),
burg Univ. (West Germany). Institut fuer
robiologie und Fischereiwissenschaft.
eters, and H. Wilke.
erientia, Vol 28, p 315-317.

criptors: Fish, *Fish physiology, *Inhibitors,
imal physiology, *Eels, *Fluorine, Organic
pounds, Biochemistry, Oxygen, Phosphorus
pounds.
tifiers: Rivulus cylindraceus, Glycolysis in-
tors, Epidermis, Energy metabolism,
oiodoacetate, Inorganic diphosphate.

n fluoride ions or monoidoacetate was added
e ambient medium, solid epidermal prolifera-
s occurred in fish larvae after 12 h and in eels
r 24 hours. The effect of glycolysis inhibitors
epidermal mitotic activity was thought to be
to an impairment of energy metabolism as it
nullified by a simultaneous application of in-
anic diphosphate or doubled O2 partial pres-
e of 320 mm Hg. (Klein)
5-02387

THE INFLUENCE OF TEMPERATURE ON SCOPE FOR ACTIVITY IN CUTTHROAT TROUT, SALMO CLARKI,
Utah Cooperative Fishery Unit, Logan.
W. P. Dwyer, and R. H. Kramer.
Transactions of the American Fisheries Society, No 3, p 552-554, 1975. 1 fig, 1 tab, 9 ref.

Descriptors: *Salmonids, *Cutthroat trout, *Metabolism, *Temperature, *Oxygen demand, Water quality, *Thermal pollution, Water pollution effects.
Identifiers: Scope for Activity(Fish).

111 active and 71 standard metabolic rate estimates were made on 90-gram cutthroat trout, Salmo clarki, at 5 temperatures. Active metabolism was lowest at 5C and highest at 15C. Scope for activity ranged from a low of 316 milligrams O2/kg-h at 5C to a high of 486 milligrams O2/kg-h at 15C, then down to 374 mg O2/kg-h at 24C. Standard metabolisms at 5, 10, 15, 20 and 24C were 47, 73, 111, 129, and 117 milligrams O2/hg-h respectively. (Klein)
W76-02388

EFFECTS OF AROCLOR 1016 ON EMBRYOS, FRY, JUVENILES, AND ADULTS OF SHEEPHEAD MINNOWS (CYPRINODON VARIEGATUS),
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
D. J. Hansen, S. C. Schimmel, and J. Forester.
Transactions of the American Fisheries Society, No 3, p 584-588, 1975. 4 tab, 12 ref.

Descriptors: *Growth stages, *Polychlorinated biphenyls, Aroclors, *Minnows, Water quality, Bioassay, *Toxicity, Water pollution sources, Fish eggs, Fry, Water pollution effects.
Identifiers: *Aroclor 1016, *Sheepshead minnow, Bioaccumulation.

The toxicity of Aroclor 1016 to various growth stages of sheepshead minnow (Cyprinodon variegatus) was investigated in intermittent-flow bioassays lasting 28 days. Survival of eggs, of fry hatched from them, and of juvenile and adult fish was not affected by 0.1-10 micrograms/liter of Aroclor 1016 added to aquaria, but 32-100 micrograms/liter killed newly hatched fry and juvenile and adult fish. Sheepshead minnows accumulated the chemical in proportion to its concentration in the test water. As much as 77 micrograms/gram of Aroclor 1016 in eggs from exposed adults apparently did not affect survival of embryos and fry. (Klein)
W76-02389

SURVIVAL AND GROWTH OF JUVENILE STRIPED BASS, MORONE SAXATILIS, IN A FACTORIAL EXPERIMENT WITH TEMPERATURE, SALINITY, AND AGE,
Virginia Inst. of Marine Science, Gloucester Point.
W. S. Otwell, and J. V. Merriner.
Transactions of the American Fisheries Society, No 3, p 560-566, 1975. 1 fig, 6 tab, 14 ref.

Descriptors: *Striped bass, *Juvenile growth stage, *Survival, *Growth rates, *Water quality, *Salinity, *Temperature.

A 3n factorial experiment to evaluate the effects of an abrupt transfer of striped bass, Morone saxatilis, from a closed system rearing facility to a variety of experimental temperature and salinity combinations demonstrated a considerable hardiness of juvenile fish. Striped bass less than two months old had over 80% survival during seven days subsequent to acute introduction from the rearing facility into temperatures of 18C or 24C and salinities of 4 ppt or 12 ppt. Relative growth in these treatments was monitored, and the results suggested a degree of flexibility for stocking programs into estuaries. (Klein)
W76-02390

TOXICITY OF JELLIED POLYACRYLAMIDE TO OLYZIAS LATIPES AND ITS GROWTH INHIBITING ACTION TO PORPHYRA TENERA, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan).
S. Ishio, and H. Nakagawa.
Report of Fishery Research Laboratory, Kyushu University, No 2, p 79-89, 1974. 5 fig, 5 tab, 14 ref.

Descriptors: *Toxicity, *Organic compounds, Fish, Hydrogen ion concentration, Growth rate, Inhibition, Ammonia, Biochemistry, Analytical techniques, Water pollution effects.
Identifiers: Olyzias latipes, Porphyra tenera, Jellied polyacrylamides.

The toxicity of jellied polyacrylamide to Olyzias latipes was acute at 8,000 ppm depending on the pH of the jelly and not toxic at concentrations less than 4,000 ppm. The causal substance of fish toxicity was free ammonia liberated when the jelly was subjected to partial hydrolysis with caustic soda. At concentrations less than 500 ppm the growth inhibiting action of jellied polyacrylamide for Porphyra tenera was not observed. Growth inhibition was found at concentrations ranging 1,000-5,000 ppm. The cause was attributed to higher pH values. (Klein)
W76-02391

EFFECT OF DIFFERENT CONSTANT INCUBATION TEMPERATURES ON EGG SURVIVAL AND EMBRYONIC DEVELOPMENT IN LAKE WHITEFISH (COREGONUS CLUPEAFORMIS),
Bureau of Commercial Fisheries, Ann Arbor, Mich. Great Lakes Fishery Lab.
L. T. Brooke.
Transactions of the American Fisheries Society, No 3, p 555-559, 1975. 3 tab, 7 ref.

Descriptors: *Freshwater fish, *Temperature, *Water quality, Growth stages, Growth rates, Fish eggs, Embryonic growth stage, Equations, *Thermal pollution, Water pollution effects.
Identifiers: *Lake Whitefish, *Coregonus clupeaformis.

Eggs of lake whitefish (Coregonus clupeaformis) were incubated in a constant-flow incubator at constant temperatures of 0.5, 2.0, 4.0, 5.9, 7.8, 10.0C. The time for fertilization to median hatch was inversely related to temperature, and ranged from 41.7 days at 10.0 C to 182 days at 0.5C. The percentage hatch was highest at 4.0, 5.9, and 7.8C, and was greatly reduced at 0.5, 2.0, and 10.0C. The mortality of embryos was greatest during the early stages of development. Abnormally developed fry were most frequency at 10.0C and least frequent at 4.0C. Mean lengths of fry at hatching were shorter at 7.8 and 10.0C than at lower temperatures. The optimum temperature range for incubation of lake whitefish eggs was 3.2-8.1C. Equations were derived for predicting development time to 20 successive stages, and to hatching, at constant incubation temperatures and at fluctuating daily mean water temperatures. (Klein)
W76-02392

GROWTH AND MORTALITY OF THE CULTIVATED MANGROVE OYSTER (CRASSOSTREA RHIZOPHORAE), (IN FRENCH),
C. L. Angell.
Mem Soc Cienc Nat La Salle. Vol 33, No 94/95, p 152-162, 1973, Illus. (Engl summ).

Descriptors: *Oysters, Shellfish, Mollusks, Aquatic life, *Growth rates, *Mortality, Cultivation, Fish management, Water pollution effects.
Identifiers: Crassostrea-Rhizophorae, Mangrove oyster, Venezuela.

Growth and mortality of the mangrove oyster (C. rhizophorae) cultivated by the hanging technique, was studied over a 10 mo. growth period. Spatfalls for Oct. and Dec. were compared. At 10 mo. of

age, oysters from both spatfalls appeared to reach an asymptotic length of approximately 7 cm. During the 1st 4 mo. of age, both groups grew equally. The Oct. spatfall grew slightly faster. The growth of oysters in Laguna La Restinga, Isla de Margarita, appeared to be similar to that in other areas of E. Venezuela. The instantaneous mortality coefficients were similar. Estimated survival for the Oct. and Dec. spatfalls were 11.21% and 9.1%, respectively.--Copyright 1975, Biological Abstracts, Inc.
W76-02439

SANITARY CHARACTERIZATION OF THE SERGEEVKA RESERVOIR, (IN RUSSIAN),
North Kazakhstan Regional Sanitary Epidemiological Station, Petropavlovsk-Kamchatskii (USSR).
E. A. Dik, and L. E. Petrovskii.
Gig Sanit. 7 p 90-91, 1974.

Descriptors: *Bacteria, *Coliforms, *Reservoirs, Rivers, Potable water, Water supply, Industrial water, *Water quality, Data collections, Pollutant identification.
Identifiers: Ishim River(USSR), Kazakh-SSR, Sergeevka, *USSR.

The Sergeevka reservoir is located on the Ishim River in the North Kazakhstan district of the Kazakh SSR (USSR), 1066 km from the mouth of the river near the city of Sergeevka. It is used for supplying potable and industrial water. Data is presented on the water quality of the Ishim River before stream-flow control in 1967 and in the reservoir in 1972: transparency, suspended matter, color, odor, pH, total hardness, chlorides, sulfates, solid residue, oxidizability, dissolved 02, biochemical 02 demand, coliform titer and F.--Copyright 1975, Biological Abstracts, Inc.
W76-02446

POTENTIAL ENVIRONMENTAL PROBLEMS OF DREDGING AND DREDGED MATERIAL DISPOSAL: DREDGED MATERIAL DISPOSAL CRITERIA,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
G. F. Lee.
In: Proceedings of the Pacific Coast Conference on Dredging, California Marine Affairs and Navigation Conference, February 10-21, 1975, San Francisco, Calif., p 62-68. (Preprint 18 p).

Descriptors: *Disposal, *Standards, *Dredging, *Water quality, Turbidity, Chemicals, Water pollution, Toxins, Pollutants, Sediments, Shellfish, Fish reproduction, Benthos.
Identifiers: *Dredge spoil, Elutriate test, San Francisco Bay.

Dredging and dredged material disposal may adversely affect water quality at dredging and disposal sites due to turbidity, mechanical effects of the operation and potentially toxic chemicals, however, available information suggests that adverse effects are rare. Dredged material disposal criteria based on bulk chemical analyses should not be used because they do not indicate the potential significance of chemical contaminants in sediments on water quality. It is recommended that the Elutriate test be used nationwide as criteria for dredged material disposal. Dredged material disposal should be prohibited in sensitive areas, such as fish-spawning or shellfish grounds. If there is potentially significant chemical contaminant release, the impact of this release on open water and on-land disposal techniques should be considered. A benthic organism bioassay test would evaluate the potential long-term adverse effects of chemical contaminants in dredged sediments on aquatic organisms. There is little evidence that chemical contaminants in sediments are adverse to aquatic ecosystems due to dredging or dredged material disposal. A comparison of the relative environmental impacts of on-land and nearshore diked area disposal with open water disposal may indicate that such alternate disposal methods may greatly increase dredging costs with little or no water quality improvement. (Buchanan-Davidson--Wisconsin)
W76-02449

THE PHYTOPLANKTON OF CANYON LAKE, ARIZONA,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
M. R. Sommerfield, R. M. Cisneros, and R. D. Olsen.
Southwestern Naturalist, Vol 20, No 1, p 45-53, May 15, 1975. 1 fig, 1 tab, 11 ref

Descriptors: *Phytoplankton, *Cyanophyta, *Chrysophyta, *Euglenophyta, *Aquatic algae, Euglena, Aquatic microorganisms, *Arizona, Succession, Chlorophyta, Eutrophication, Aquatic microbiology, Water quality, Limnology.
Identifiers: *Canyon Lake(Ariz), Bacillariophyceae, Dinophyceae.

Data were obtained on phytoplankton composition and their seasonal dynamics in Canyon Lake, located about 50 miles northeast of Phoenix, Arizona. From March, 1971 through February, 1972, over 100 species were identified as belonging to the following classes: Chlorophyceae 42 species, Bacillariophyceae 46 species, Cyanophyceae 8 species, Chrysophyceae 3 species, Euglenophyceae 4 species, and Dinophyceae 2 species. A majority of the organisms were found in small numbers, whereas a few reached bloom proportions. A well-defined succession was observed with each class of algae showing some periodicity. The lack of previous data on other central Arizona lakes is indicated by the more than 50 species found which have not been previously recorded in the state. The largest phytoplankton populations were recorded in February-March and August-September. (Robinett-Arizona)
W76-02459

EFFECT OF AMMONIUM LIGNOSULFONATE ON SOIL MICROORGANISMS (O VLIYANII LIGNOSUL'FONATA AMMONIYA NA POCHVENNYE MIKROORGANIZMY),
Akademiya Nauk SSSR, Moscow. Institut Agrokhimii i Pochvovedeniya.
T. P. Malygina, L. V. Evtikova, and E. V. Vasil'ev.
Pochvovedenie, No 3, p 73-76, 1974. 1 illus, 6 ref, 1 tab. English Summary.

Descriptors: *Lignins, *Soil microorganisms, *Sulfite liquors, *Pulp wastes, Industrial wastes, Wastes, Toxicity, Chemical wastes, Water pollution sources, Toxins, Soil bacteria, Bacteria, Azotobacter, Electrodialysis, Calcium hydroxide, Cobalt, Salts, Waste disposal, Ammonium salts, Flood plains, Soil disposal fields, Ultimate disposal.
Identifiers: *Lignosulfonates, Azotobacter chroococcum, Don River(USSR), Soviet Union(USSR), Spent sulfite liquor, Spent pulping liquors.

In connection with the use of lignosulfonates (such as found in spent sulfite pulp liquors) as soil conditioners, a study was made of their effects on soil microflora. Laboratory tests were conducted with Azotobacter chroococcum and the following preparations: technical ammonium lignosulfonates (containing organic and acidic mineral impurities), and three high-molecular preparations obtained by treatment of the technical lignosulfonates with calcium hydroxide, with a complex cobalt salt, and by electrodialysis. The concentration of the lignosulfonate in the nutrient medium was 0.1-1.5%. The high-molecular fraction separated by electrodialysis was the least toxic: there was a good growth of the bacteria at a concentration of 1%. At the same concentration, the technical lignosulfonate was inhibitory. It is suggested that the toxic action is due to the acidic admixtures [illegible] the technical lignosulfonate. Field experiments with the technical lignosulfonate were conducted on soils of the lower Don River floodplains. When introduced into the soils in an amount of 1 t/ha, technical lignosulfonate had a stimulating action on soil microorganisms, as determined by plate counts (Stapinski-IPC)
W76-02464

5D. Waste Treatment Processes

ELECTROLYTIC TREATMENT OF JOB SHOP METAL FINISHING WASTEWATER,
New England Plating Co., Inc., Worcester, Mass.
B. E. Warner
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-600/2-75-0[illegible] September 1975. 151 p, 26 fig, 19 tab. EPA 1BB036,ROAP 21AZ0,Task 15 ;2010 GUG

Descriptors: Chlorination, *Industrial wastes, *Waste water treatment, *Electrolysis, Chromium, Oxidation
Identifiers: *Electrochemical treatment, Chemical treatment, Semi-conductive bed electrolysis, *Chromium reduction, *Cyanide oxidation.

Full scale in-plant production studies demonstrated the reliability and economics of electrolytic cells containing beds of conductive particles between cathodes and anodes for reduction of hexavalent chromium and oxidation of cyanide in plating rinse water. The heavy metals are subsequently removed from the waste water by alkaline precipitation. Seventy-five liter/min. (2- GPM) sized cells were employed for chromium and cyanide rinses. Chromium concentrations to 2[illegible] mg/liter and cyanide concentrations to 150 mg/liter were processed. Data were obtained with parallel equipment using chemical treatment for cost comparison. At low chromium concentrations (less than 25 mg/liter), chemical reduction was more economical. At higher concentrations ([illegible] mg/liter), electrolytic reduction became the more economical process. In cyanide oxidation, the electrochemical process reduced direct costs associated with chlorination. Waste treatment costs, capital and operating, for the job shop are provided with an assessment of total costs on the price of services provided. Water conservation techniques are described. Experience with tube settling equipment for removal of suspended solids and centrifuge for sludge concentration is provided. (EPA)
W76-02070

TRENCH INCORPORATION OF SEWAGE SLUDGE IN MARGINAL AGRICULTURAL LAND,
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.
J. M. Walker, W. D. Burge, R. L. Chaney, E. Epstein, and J. D. Menzies.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-600/2-75-03[illegible] September 1975. 231 p, 58 fig, 69 tab, append. EPA 1BB043 (ROAP 21-ASE, Task 027). 68-01-0162.

Descriptors: *Sludge disposal, Metals, *Sewage sludge, Land reclamation, Waste disposal, *Trenches, *Waste treatment, Salmonella, Limes, Coliform bacteria.
Identifiers: Limed raw sludge, Digested sludge.

A trench method was tested for transporting and placing digested and limed raw (undigested) sewage sludges (8% and 20% solids) in trenches in study soil at loadings up to 1150 dry tons/hectare (500 dry tons/acre) without odor problems or hazard of surface runoff. Field scale trenching was best achieved by digging the trenches on contour not more than 75 cm deep, 60 cm wide, and from

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75 cm apart. The study indicated that the best e transport method would employ concrete · trucks. Trenches could then be filled dly from discharge chutes or indirectly with a altic pump. A tracked trenching machine a maneuverable rear-mounted digging wheel , new trench and simultaneously backfilled a el sludged trench. In 2 years, neither heavy ls nor pollution indicator organisms (coliform almonella) have moved more than about 30 om entrenched sludge into surrounding soil. rate amounts of nitrate nitrogen have moved underdrainage water but not into the un- ound aquifer. The lime in the sludge reduced l movement into soil and availability to crops netal uptake was modest. Tested agricultural ices included cross ripping, tilling, and ping, with grasses recommended for the first Entrenchment appeared feasible for sludge sal and improving marginal land. (EPA)
-02072

ETIC MODEL FOR ORTHOPHOSPHATE CTIONS IN MINERAL SOILS,
ronmental Protection Agency, Ada, Okla. ert S. Kerr Environmental Research Lab.
. Enfield, and B. E. Bledsoe.
ilable from the National Technical Informa- Service, Springfield, Va 22161. Environmen- rotection Agency, Report EPA-660/2-75-022, 1975. 133 p, 12 fig, 6 tab, 84 ref, append. EPA 045. ROAP 21-ASH, Task 13.

criptors: Kinetics, *Model studies, Soils, Solu- y, *Waste water treatment, Phosphorus, hematical models, *Sewage treatment.
tifiers: *Phosphorus kinetics, hophosphates, *Mineral soils.

ability of a soil to remove wastewater sphorus from solutions passing through the matrix is primarily related to the formation of tively insoluble phosphate compounds of iron, inum, and calcium. Based on the solubility of e compounds, an estimate can be made of the mum concentration of phosphorus which will ound at equilibrium in the soil solution. The tics of orthophosphorus sorption with 25 via- mineral soils were experimentally measured er laboratory conditions. Several kinetic dels were evaluated as a means of describing sphorus sorption by soil. A diffusion limited gmuir sorption model best fit the experimental . (EPA)
5-02073

EATMENT OF COMBINED SEWER OVER- OWS BY DISSOLVED AIR FLOTATION,
ineering-Science, Inc., Berkeley, Calif.
. Bursztynsky, D. L. Feuerstein, W. O. ddaus, and C. H. Huang.
ilable from the National Technical Informa- Service, Springfield, Va 22161. Environmen- Protection Agency, Report EPA-600/2-75-033, tember 1975. 213 p, 54 fig, 42 tab, 16 ref, 6 ap- d. EPA 1BB034. WPRO-258-01-68.

criptors: *Combined sewers, *Flotation, ign, Overflows, *Waste water treatment, Pilot nts, Suspended solids, *Operating costs, ifornia, Runoff, Treatment facilities, Storm ru- f, Storm water.
ntifiers: *Dissolved air flotation, *Combined er overflow, San Francisco(Calif).

s program investigated the use of dissolved air ation for the treatment of combined sewer rflows. A 24-mgd prototype facility was con- cted and evaluated. The most recent study se demonstrated the performance charac- stics of the prototype Baker Street dissolved flotation facility for the treatment of combined er overflows under a broad range of operating ditions. Summary data from initial studies in program using a pilot plant and the prototype ility with dry-weather flow are compared with the recent results. Improvements are suggested in the design and operation of dissolved air flotation facilities. Under several specific test conditions the Baker Street facilitity effected reductions in comgined sewage constituents which resulted in an effluent quality meeting some local discharge requirements. Difficulties were encountered with alum floc carry-over into the effluent. Wastewater pollutant removals were highest--51 percent suspended solids from an influent of 99.5 mg/l and 82 percent BOD from an influent of 32.1 mg/l, measured in Test No. 8--at surface loading rates of 145 m3/(m)2 (day) (3,580 gal/ (ft)2(day)), an alum dosage of 75 mg/l, and a minimum air to solids ratio of 0.05 kg air/kg solids. Specific design modifications are recommended for investigation to determine their effect on system performance of the Baker Street facility. The construction cost for the 24-mgd Baker Street facility with architectural treatment was $2,518,000, adjusted to an ENR index of 2240. Annual O and M costs are calculated to be $17,200. (EPA)
W76-02074

AEROBIC STABILIZATION OF WASTE ACTIVATED SLUDGE - AN EXPERIMENTAL INVESTIGATION,
Metropolitan Denver Sewage Disposal District No 1, Commerce City, Colo.
D. B. Cohen, and D. G. Fullerton.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-600/2-75-035, September 1975. 174 p, 62 fig, 47 tab, 17 ref, append. EPA 1BB043 (ROAP 21ASD, Task 17). 68-03-0152.

Descriptors: *Biodegradation, *Activated sludge, *Aerobic conditions, *Oxygenation, Respiration, Odor, Biochemical oxygen demand, Metalbolism, Biomass, *Design criteria, Hygiene, Aerobic bacteria, Flotation, *Sludge digestion, Filtration, *Waste water treatment.
Identifiers: Biodegradable solids destruction, Odor reduction, Pathogenic organisms elimination, Denver(Colo).

Metro Denver Sewage Disposal District No 1 (Metro) in 1970 converted excess secondary aerators to aerobic digestors. The plant scale diffused air system was compared with a pilot scale open tank oxygen system using very fine bubble fixed and rotating diffusers. For the air system volatile suspended solids (VSS) reductions ranged between 11.2% and 47.2%. A significant correlation was observed between VSS reduction and detention time-temperature factor. Cold shock eliminated nitrification for a five month period. When invertebrates, particularly rotifers, comprised a significant fraction of the biomass, digestion was maximal. The pollutant concentration in the supernatant from the aerobic digestor averaged 10% of that from an anaerobic digester. For the oxygen batch tests, biodegradable VSS digestion rate coefficient k averaged 0.27. No correlation was observed between DO concentration and VSS reduction rates. The temperature of the oxygen digested biomass increased with increased loadings. At loadings greater than 2.25 kg VSS/m3/day (0.14 lb VSS/ft3/day), oxygen performance was superior to the diffused air system. Loadings as high as 9.6 kg VSS/m3/day (0.60 lb VSS/ft3/day) were successfully employed with the rotating diffuser oxygen system. To continue the aerobic digestion economic benefits of reduced sludged disposal costs, Metro is considering conversion of a 3,785 cubic meter (1 million gallon) sludge holding tank to an oxygen digester. (EPA)
W76-02076

INFILTRATION--INFLOW ANALYSIS,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
D. J. Cesareo, and R. Field.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE5, p 775-785, October, 1975.

Descriptors: *Infiltration, *Inflow, *Cost analysis, *Sewers, Rehabilitation, Treatment facilities, Construction costs, Simulation analysis, Waste water treatment, Evaluation.
Identifiers: *Infiltration/inflow analysis(i/i).

Excessive infiltration/inflow (i/i) from runoff has been defined as the quantities of i/i that can be economically eliminated from a sewer system by rehabilitation. This value is determined by a cost-effectiveness analysis in which the costs of correcting the infiltration/inflow conditions are compared with the costs of increasing the treatment works capacity to provide proper treatment of the i/i quantities. Countermeasures against infiltration and inflow involve either the prevention of excessive extraneous flows or the correction of conditions already imposed on existing sewer systems. A cost-effectiveness evaluation of a surcharged sewer system and overloaded waste water treatment facility should consider at least: increased size and cost of new sewers if i/i is permitted; need for construction of relief or supplementary collection and interceptor sewers; operation and maintenance costs for handling sewer surcharges, clean up of flooded areas and damages to flooded private properties; costs of repairing pavement cave-ins or washouts of subsurface utilities caused by infiltration and exfiltration; costs of removing soil, debris, and tree roots entering sewers through defective sewer pipes and joints; increased costs at waste water treatment facilities; and future elimination of bypassing untreated flows from sewers. The five phases of a sewer system evaluation survey were outlined as: physical survey; rainfall simulation; preparatory cleaning; internal inspection; and survey report. A hypothetical infiltration/inflow cost evaluation was presented, and costs for an infiltration reduction program in Locust Grove, Oklahoma, and an inflow reduction program at Springfield, Illinois, were detailed. (Kramer-FIRL)
W76-02170

A FAIL-SAFE SUBAQUEOUS CONCRETE SEWER,
Ameron Pipe Products Group, El Monte, Calif. Southern California Div.
For primary bibliographic entry see Field 8F.
W76-02171

SEWER LINING--THE TORONTO TECHNIQUE,
Department of Public Works, Toronto (Ontario).
For primary bibliographic entry see Field 8G.
W76-02172

PUMPS AND VALVES FOR THE WATER INDUSTRY.
For primary bibliographic entry see Field 8C.
W76-02173

NEW SEWER SURVEY TV CAMERAS.
For primary bibliographic entry see Field 8G.
W76-02174

LARGE DIAMETER SEWER AVERAGES $234.50 PER LIN FT.
Engineering News Record, Vol 195, No 18, p 35, October 30, 1975. 1 tab.

Descriptors: *Costs, *Sewers, Concrete, Engineering, Tunnels, Manholes, Construction materials, District of Columbia.
Identifiers: Gravity sewers, Washington(DC).

The lowest prices for 5220 linear ft of 102-in diameter reinforced concrete gravity sewer averaged $234.50 per linear ft in a competition

among 13 contractors for a suburban Washington, D.C. sanitary sewer project. The contract was taken for $2,596,944, 22% below the original engineering estimate, and 13.4% below the second lowest bidder. A 102-in diameter pipe and 920 linear ft of 72-in diameter concrete sewer pipe will be installed in trenches as deep as 22 ft that will parallel the Anacostia River. Project work will include building 150-in diameter steel lined tunnels to carry a 270-ft long section of pipe under a highway and another section 35 ft deep under railroad tracks. Additionally, a 24-ft deep manhole will be built to connect the 102-in diameter pipe to an existing line. Data are provided on the prices of various construction materials for the project. (Kramer-FIRL)
W76-02175

BROADER LOAN PROGRAM INTRODUCED FOR MUNICIPAL SEWERAGE PROJECTS.
For primary bibliographic entry see Field 6C.
W76-02176

LASER TUNNELLING GUIDANCE SYSTEM.
For primary bibliographic entry see Field 8G.
W76-02177

PLASTIC MORTAR PIPE SOLVES JOINT PROBLEM,
For primary bibliographic entry see Field 8G.
W76-02178

FILTER-PRESS FOR DRYING WASTE AND SEWAGE SLUDGES.
French Patent FR 2242-133, Issued May 2, 1975, Derwent French Patents Abstracts, Vol W, No 23, p D3, July 1975.

Descriptors: *Filters, *Dewatering, *Waste water treatment, *Patents, *Sewage treatment, Equipment, Sludge treatment.
Identifiers: *Filter presses.

A patent was issued forca filter press which dewaters waste water and sewage sludges. The press consists of two endless filtering bands which are guided around a roller assembly to follow concentric trajectories, one on the inside and the other around a common arc. The sludge to be treated is pumped into a mixer where it is flocculated; the mixture then passes through a reaction chamber which provided with a wide overflow. Sludge is pressed between the two bands by the pressure of adjustable rollers. The water is squeezed out and this is collected by metallic plates. The system is very compact, and the sludge is treated in successive stages for an increased drying effect. (Kramer-FIRL)
W76-02179

AERATING PROPELLOR FOR BIOLOGICAL PURIFICATION OF WASTE WATER.
Netherlands Patent NL 7416-582. Issued July 25, 1975. Derwent Netherlands Patents Abstracts, Vol W, No 32, p D1, September 1975.

Descriptors: *Patents, *Aeration, *Biological treatment, *Waste water treatment, Liquid wastes, Organic matter.
Identifiers: *Aerators, Propellors.

A patented aerating propellor for the biological treatment of waste water is described. This power driven, high speed rotary propellor is mounted on the end of a hollow shaft. An air inlet above the surface of the liquid in which the propellor is immersed induces vigorous aeration of the liquid via an air outlet at the end of the shaft. The propellor has at least one helical blade extending around at least two-thirds of the circumference of the shaft. Polluted liquid is vigorously areated to improve biological purification by increasing the bacterial action to oxidize dissolved organic matter. A compact and powerful jet is directed axially from the propellor and will disperse dead pockets, prevent sedimentation, and avoid stagnation. Because the aerating efficiency is higher than with conventional agitators, reduced power requirements and low blade stresses are found. (Kramer-FIRL)
W76-02180

PRESSURE SEWER SYSTEM,
Equipment/One Corp., Schenectady, N.Y. (assignee).
R. P. Farrell, Jr., R. C. Grace, and W. J. Doyle.
United States Patent 3,904,131. Issued September 9, 1975, Vol 938, No 2, p 643, September 1975. 1 fig.

Descriptors: *Patents, *Sewers, *Sewerage, *Waste water treatment, *Sewage treatment, Liquid wastes, Pumps.
Identifiers: *Pressure sewers.

A patent has been issued for a pressure sewer system. This sewage transport system includes a combination of several sewage generating sites, each of which includes at least one collection tank. A grinder is arranged so that the liquid sewage is suctioned from the tank and ground liquid slurry sewage is discharged from its outlet. A pump has its inlet connected to the outlet of the grinder and provides a significant discharge flow of ground liquid slurry sewage under pressure from its outlet. Outlet check valves within the discharge passage permit liquid sewage to flow only to the direction from the outlet of the pump to a receiving point and prevent backflow of pressurized liquid sewage. (Kramer-FIRL)
W76-02181

BIOLOGICAL PURIFICATION OF WASTE WATER AND SEWAGE.
French Patent FR 2238-675. Issued March 28, 1975. Derwent French Patents Abstracts, Vol W, No 19, p D3, June 1975.

Descriptors: *Patents, *Biological treatment, *Bacteria, *Algae, Nitrogen, Phosphorus, Nutrient removal, Biochemical oxygen demand, *Waste water treatment, Equipment.
Identifiers: Symbiosis.

A system of biological purification of waste water and sewage has been patented which involves algal and bacterial symbiosis. The conventional activated sludge process reduces the BOD but only has a slight effect on nitrogen and phosphorus levels. This new process results in a more rapid reduction of the BOD and COD; it also reduces nitrogen, phosphorus, and pathogenic germs. Water is fed into a tank and is illuminated by appropriately placed lamps. Automatic stirring takes place. Unicellular algae and bacteria, naturally present in the water to be treated, grow considerably in the illuminated medium. Bacteria, using the oxygen supplied by the algae, degrade the organic matter and liberate carbon dioxide. Mineral matter is assimilated by the algae. Water is pumped to a pressurized enclosure equipped with candle filters and the filtered water is collected. Secondary or tertiary treatment may also be effected in the same tank and the algal material can be collected and reused. (Kramer-FIRL)
W76-02182

ACTIVATED SLUDGE TREATMENT TANK WITH CHEMICAL AERATOR.
German Patent DS 2324-678. Issued July 31, 1975. Derwent German Patent Abstracts, Vol W, No 32, p D1, September 1975.

Descriptors: *Patents, *Activated sludge, *Aeration, *Clarification, Biological treatment, *Waste water treatment, Separation techniques, Equipment.
Identifiers: Aerators, After clarification chamber(ACC).

A patent has been granted for an activated sl treatment tank with a central aerator. On several pipe lines are provided in addition to lines connected to a standpipe. These are adj ble in height and end in the region of the water face of the after clarification chamber (ACC). additional pipe lines terminate in a shaft arra outside of a circular basin. The shaft is structed to allow the waste water flowing thr enough time to separate out the floating sludg the water surface and to prevent a short circu of the flow between the two pipe lines. The sh equipped with an overflow weir adjustabl height, located before the mouth of the pipe ending in the region of the water surface of ACC. A regular withdrawal of excess floc sludge from the ACC is possible, maintaining control over this removal process. (Kramer-FI
W76-02183

THICKENING ACTIVATED SLUDGE FR EFFLUENT TREATMENT PLANTS.
Netherlands Patent NL 7316-640. Issued Jun 1975. Derwent Netherlands Patents Abstracts, W, No. 25, p D1, July 1975.

Descriptors: *Patents, *Dewatering, *Waste w treatment, *Sludge treatment, Activated slu Biological treatment, Recycling, Treatment fa ties.
Identifiers: *Sludge thickening.

A method for thickening activated sludge f biological treatment plants has been patented. concentration of sludge discharged from an fluent purification plant may be increased by lowing the flocs of sludge to settle in a reservo the presence of heavy particles introduced into liquid. The settled material is supplied to at l one hydro-cyclone in which the sludge flocs separated from the heavy particles which are r cled to the reservoir. Sludges which settle with difficulty and/or very slowly may thickened with this system and will achieve centrations suitable for centrifugation. Th heavy particles have a high specific gravity r tive to the sludge flocs and a particle size of 1 100 microns. They may consist of magnetite, rosilicon, or suitable types of sand or loess. concentration of heavy particles used to ent the sludge should be less than 25 g/liter. (Kra FIRL)
W76-02184

DESIGN SEMINAR FOR LAND TREATME OF MUNICIPAL WASTEWATER EFFLUEN DESIGN FACTORS, PART I,
Metcalf and Eddy, Inc., Palo Alto, Calif.
C. E. Pound, and R. W. Crites.
Prepared for Environmental Protection Agen Technology Transfer Program, August, 1975, 5 2 fig, 12 tab, 37 ref.

Descriptors: *Design criteria, *Waste wa disposal, *Municipal wastes, Irrigation, Land u Runoff, Public health, Soils, Monitoring, Wa treatment, Water reuse.
Identifiers: *Land treatment, Overland flow, In tration/percolation, Land application.

As the first of two papers prepared for the E vironmental Protection Agency Technol Transfer Program on Land Treatment of M nicipal Wastewater Effluents, some of the ba design factors for land application are present Objectives of land application processes discussed, as well as preapplication treatme land suitability, selection of the land applicat process distribution techniques, climatic facto storage, surface runoff control, public health co siderations, and monitoring requiremen Because land application systems are site-spec and flexible, there are several alternatives. Th approaches to land treatment were detailed: irri tion, for the growth of plants; infilt tion/percolation, a high rate application proce

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verland flow, using impermeable soils. The tives of irrigation are containment of nutrient , economic return, and water conservation; tives of infiltration/percolation are ground- recharge; and overland flow is used primari- secondary treatment or advanced waste treatment. Land requirements for each type d application include the wetted land area as as miscellaneous buffer areas. Sites must be ated for climate, topography, vegetation, gy, and soils. The suitability of a site depends its location, compatibility with overall land lans, proximity to surface water, and the er and size of land parcels. Monitoring is dered very important for land treatment ms, particular to determine the cation nge capacity (CEC) of the soil. (Kramer-
)
02185

GN SEMINAR FOR LAND TREATMENT MUNICIPAL WASTEWATER EFFLUENTS. GN FACTORS, PART II,
M/Hill, Denver, Colo.
. Powell.
ared for Environmental Protection Agency, nology Transfer Program, September 1975, 22 fig, 10 tab, 43 ref.

riptors: *Waste water disposal, *Municipal es, Irrigation, Groundwater, Irrigation, Land Design criteria, Environmental effects, Waste ment, Water reuse.
ifiers: Effluent loading, Land treatment, ndwater mound.

e second of two papers prepared on design rs for land treatment of municipal waste effluents, a review of land application esses and factors influencing the identifica- and selection of land application sites is nted. Effluent loading constraints, effluent ng design and the operation of alternative application systems are detailed. An emphasis placed on the design of a suitable loading rate he requirements for drainage, field investiga- , monitoring systems, crop selection, irriga- schedules, and farm management. An exam- f the selection process was graphically illus- d for Colorado, involving location, land ability and costs, environmental impacts, ng capacity, and water rights. Impacts on ndwater of the high rate irrigation process and nfiltration/percolation were compared. Ef- t loading constraints--climatic, infiltration, lation, nutrient removal, ss, BOD, COD, and anics--were discussed. In designing a suitable lexible loading rate, the goal should be rela- constant movement through soil, avoiding sired seasonal load. It was recommended that cation be increased during the peak of the otranspirational period. In systems using an tion method for land treatment, the ground- mound must be taken into account. As this nd builds up over time, the loading rate must ecreased to postpone the need for drainage. mer-FIRL)
-02186

FACE AERATORS FOR EFFLUENT ATMENT.
eyor, Vol 146, No 4344, p 56, September 12,

riptors: *Aeration, *Sewage treatment, ste water treatment, Installation, Treatment ties, Effluents, Dissolved oxygen, Models, ons.
ifiers: *Aqua-lator surface aerators.

ing Aqua-lator surface aerators have been loped for the treatment of sewage and indus- effluents prior to discharge. These were gned for installation in a lagoon or river, or in a tank at a treatment works. The aerators work efficiently when distributed at progressively increasing distance so that each aerator receives effluent from the previous one when the dissolved oxygen level drops to about one mg/liter. Two basic types of Aqua-lator aerators are series FLTM, with ratings of up to 20 hp, comprising a glassfiber floating unit supporting an axial pump; and series 400, covering ratings of up to 75 hp. These models are based on the same principle but the series 400 models were designed to follow special hydraulic optimization. Both types of Aqua-lator aerators can be equipped with anti-swirling devices. Other options include a draft tube for deep tank operation and an antierosion device for very shallow lagoons. (Kramer-FIRL)
W76-02187

MUNICIPAL WASTEWATER REUSE IN THE U.S.,
SCS Engineers, Long Beach, Calif.
C. J. Schmidt, I. Kugelman, and E. V. Clements, III.
Journal Water Pollution Control Federation, Vol 47, No 9, p 2229-2245, September 1975, 18 tab, 2 ref.

Descriptors: *Water reuse, *Municipal wastes, *Recycling, Irrigation, Groundwater, Water pollution control, Groundwater resources, Municipal water, Waste water treatment, Lakes, Cooling water.
Identifiers: *Waste water reuse, Industrial reuse.

A state-of-the-art survey was compiled on existing municipal waste water reuse systems. The examples provided emphasize direct reuse of the water as it leaves the treatment plant. Data were organized into the categories of: irrigation and other agricultural uses, cooling water, industrial process water, boiler feed water, recreational lakes, fish propagation, and nonpotable domestic use. Operations for 358 sites in the United States were studied. Of these locations, about 95% were in the semi-arid southwest states of Texas, California, Arizona, New Mexico, Colorado, and Nevada. Total reuse volume was 133 bil gal, exclusive of groundwater recharge. About one quarter of the plants furnishing waste water for irrigation in 1972 provided only primary treatment. While many irrigation systems were intended as disposal methods, there has been increased concern that pollution and infiltration may have an adverse effect on groundwater resources. Only 14 industrial plants now use municipal waste water, and potential industrial reuse opportunities have not been recognized. Treated municipal waste water has been used for cooling water makeup at 12 facilities. This is probably the most underdeveloped reuse potential of such waste waters. Three California municipal treatment plants now provide treated effluent for major lake recreational projects; these are successfully providing high quality effluent, and pose no health hazards. Overall, only a small percentage of municipal waste water is reused in this country, and continued development of reclamation programs is recommended. (Kramer-FIRL)
W76-02189

WASTE WATER AERATION WITH OXYGEN (ABWASSERBELUEFTUNG MIT SAUERSTOFF),
F. Karnovsky.
Abwassertechnik, Vol 26, No 3, p 18-20, 1975. 6 fig.

Descriptors: *Waste water treatment, *Aeration, *Oxygen, Sludge treatment, Biological treatment, Oxygenation.
Identifiers: UNOX process.

Methods and equipment for the aeration of waste water with technical-grade oxygen rather than with air, as developed by Union Carbide, Airco, Ames Crosta, and Linde AG, are described. The UNOX system developed by Union Carbide uses series-connected closed aerator tanks into which oxygen is admitted through perforated pipes. The Airco System uses tubular reactor for the oxygenation of waste water mixed with oxygen-enriched activated sludge and return sludge. A combination of a first biological stage with oxygen and a second flotation stage using air was used experimentally in France. Compared with conventional aeration, oxygenation offers an increased oxygen content in the waste water, increased sludge concentration, and consequently an increased purification efficiency at a slightly increased operating cost. (Takacs-FIRL)
W76-02190

FLOW EQUALIZATION--PLUS FOR WASTEWATER TREATMENT PLANTS.
Civil Engineering--ASCE, Vol 45, No 9, p 66-68, September 1975, 2 fig, 1 tab.

Descriptors: *Flow rates, *Waste water treatment, *Treatment facilities, Retention, Effluents, Design criteria, Economics.
Identifiers: *Flow equalization, *Retention basins, Peak flows.

Flow equalization for waste water treatment processes is discussed, particularly the achievement of equalization by building retention basins at the treatment site. Advantages of a 'steady-state' waste water treatment process are the potential for better biological and chemical actions, resulting in improved effluent; design economies with the elimination of peak flows; power savings; and operation reliability. Two EPA projects in Michigan were investigated in detail. One at Ypsilanti uses an in-line retention basin where all flow is passed through the basin and the other, at Walled Lake, uses a side-line basin where only excess flows are diverted. One reason that more plants have not used retention basins is that traditional plant design includes oversize clarifiers. Because of EPA effluent standards, plants must now be designed for peak flows. Proponents of flow equalization believe that design should return to average flow criteria. The cost effectiveness advantage of flow equalization rather than overdesigning has not been resolved. Besides regulatory agency restrictions, cost decision on flow equalization will depend upon individual factors for a given plant, such as size of facility, flow variations, quality of influent, desired quality of effluent, and site considerations. (Kramer-FIRL)
W76-02191

DIFFERENT AERATION SYSTEMS FOR GROUNDWATER AND SURFACE WATER (VERSCHIEDENE SYSTEME ZUR BELUEFTUNG VON GRUNDUND OBERFLAECHENWASSER),
B. Moergeli, and J. Ginocchi.
Chemie-Technik, Vol 4, No 5, p 175-178, 1975, 9 fig, 13 ref.

Descriptors: *Groundwater, *Surface waters, *Aeration, *Water treatment, *Waste water treatment, Biological treatment, Equipment.
Identifiers: Aerators.

Different types of aeration systems for groundwater and surface water are described and compared. Open aeration systems such as atomizers, ring aerators, and corrugated foil type aerators have diffusion coefficients of 150/hr, 50/hr, and 170/hr, as well as surface loads of 250 cu m/sq m per hr to 800 cu m/sq m per hr, respectively. Closed aerating systems are bubbling aerators or surface aerators, such as roller and gyro type aerators, or aerators with submerged pumps. Surface aerators are used when the water to be aerated has sufficient flow speed. The closed type Sulzer aerator, consisting of a cylinder providing for intense mixing of the two phases and for continuous renewal of the phase boundary, proved to be most efficient of all aerators investigated. It adopts the static system and parallel flow of water and com-

pressed air. It ensures a diffusion coefficient of 170/hr and surface loads of up to 1,000 cu m/sq m per hr. (Takacs-FIRL)
W76-02192

HORSHAM TESTS COMPLETE.
For primary bibliographic entry see Field 8G.
W76-02194

SEWAGE DISPOSAL PLANT WITH AUTOMATIC CONTROL SYSTEM.
Hokushin News, Vol 18, No 1, p 4-12, May, 1975, 10 fig, 5 tab.

Descriptors: *Sewage disposal, *Waste water treatment, *Control systems, *Automation, Flow meters, Aeration, Biological treatment, Water treatment, Filtration, Chemical precipitation, Ozone, Ion exchange, Activated carbon.

A general discussion was presented on a control system for waste water treatment. Control of inflow waste water was done by an electromagnetic flow meter and a P-B flume was used for outflow water. Sludge at the bottom of the initial sedimentation basin was removed periodically, particularly when it reached a high concentration (1-1.5%). An ultra-sonic damping device was used to give signals to stop the removal when the sludge concentration was too low. The flow rate of inlet air to the aeration tank was usually proportional to the flow rate of inflow waste water and the ratio was determined by dissolved oxygen, BOD, and suspended solids. Sludge was usually digested at about 35 degrees C and the heating was accomplished by passing hot water at about 55 degrees C or by directly introducing steam. The fermentation temperature was controlled by a platinum-resistance type meter. A three-phase treatment method was applied for water treatment by using, microfiltration, coagulation-precipitation, high speed filtering with sand, ozone oxidation, ion exchange, and activated carbon. (Su-FIRL)
W76-02196

ARTIFICIAL GROUNDWATER RECHARGE AND WASTEWATER RECLAMATION,
Suffolk County Dept. of Health, N.Y.
J. J. Baffa.
Journal of the American Water Works Association, Vol 67, No 9, p 471-476, September, 1975, 8 fig, 5 ref.

Descriptors: *Recharge, *Groundwater, *Recycling, Water supply, Conservation, Economics, Injection wells, Municipal wastes, Water reuse.
Identifiers: *Artificial groundwater recharge, Groundwater management.

Economic, conservation, and research factors pertinent to artificial groundwater recharge and waste water reclamation were discussed. Artificial recharge of aquifers has been used successfully for groundwater management in preventing losses to stream flow. Research has been conducted on hydraulic aspects, particularly on how to most efficiently use the soil and recharge water interface to allow maximum rates of transfer of recharge water to the aquifer. The capability of these systems to remove nitrogen from waste waters has been of considerable interest. A pilot plant shallow well injection system was tested. Effluent from a municipal single-stage trickling filter plant was injected through wells, which were then used for water quality sampling. After a three-year period, water quality parameters were separated into two categories: those of a soluble stable mineral character such as chlorides and alkalinity; and those with latent biological propensities such as nitrogen compounds, sulfates, phosphates, carbon dioxide, and organic solids. Concentrations found were affected by the amount of water recharged, the amount of natural groundwater flow (which causes dilution), changes in aquifer permeability from clogging, and biochemical effects of bacterial action. It was concluded that for all water quality parameters, adsorption and dilution were important factors. To reduce soil clogging and to prevent release of unwanted nitrogenous compounds, it was suggested that organics and nutrients be removed by tertiary treatment, particularly when the objective of artificial recharge is municipal water supply. (Kramer-FIRL)
W76-02197

COLLECTION AND PURIFICATION OF WASTEWATERS (AUFFANGEN UND REINIGEN VON ABWAESSERN).
Kunstotosffberater, Vol 20, No 8, p 390, August 1975.

Descriptors: *Runoff, *Storm water, Pollution identification, Chemical industry, *Waste water treatment, Water discharge, Treatment facilities.
Identifiers: *Collection basins.

The uncontrolled runoff of chemically contaminated storm water near a chemical plant in southern England made it necessary to build an 11 million liter-capacity collection basin measuring 107 m x 38 m at a maximum depth of 7.5 m. The bottom of the basin was tightly sealed by means of Hypalon, a weather-proof chemical-resistant synthetic rubber soil manufactured by Burke Rubber Company, San Jose, California. The black foil is 0.76 mm thick, and is composed of two Hypalon layers and an interposed nylon layer. The guaranteed service life of the foil is 20 yr. The contaminated storm runoff collected in the basin is pumped over to a treatment unit before being discharged into a river. (Takacs-FIRL)
W76-02198

SEWER PIPE RUN PASSES DEFLECTOMETER TESTS.
For primary bibliographic entry see Field 8G.
W76-02200

CAPACITIES OF STACKS IN SANITARY DRAINAGE SYSTEMS FOR BUILDINGS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 8B.
W76-02201

PLASTIC PIPE USE GROWS FOR SEWER MAIN INSTALLATIONS.
For primary bibliographic entry see Field 8G.
W76-02202

BIG BACKHOE BOOSTS SEWER FOOTAGES.
For primary bibliographic entry see Field 8C.
W76-02203

BACKHOE AND LOADER TEAM UP ON UNUSUAL SEWAGE SYSTEM.
For primary bibliographic entry see Field 8C.
W76-02204

METHOD AND APPARATUS FOR THE PURIFICATION OF AQUEOUS EFFLUENT,
J. R. Kaelin.
United States Patent 3,910,838, Issued October 7, 1975. Official Gazette of the United States Patent Office, Vol 939, No 1, p 340, October, 1975, 1 fig.

Descriptors: *Patents, *Aeration, *Oxygen, *Waste water treatment, *Liquid wastes, Equipment, Effluents, Tanks, Mixing, Tanks.

A patented method for treating liquid wastes has been described. Effluents are conducted directly into one end of a closed tank. This tank is located within a residence tank of larger capacity. Oxygen or an oxygen mixture is supplied to the effluent as it is conducted into the mixing tank. This oxygenated liquid is then passed through an exte flow path within the mixing tank, increasing reaction between the oxygen and the effluent. oxygenated waste is then discharged from other end of the mixing tank into the resid tank through several conduits. These conduit arranged near the floor of the residence tank oriented so that a strong rotary flow is produc this region, avoiding the formation of sl deposits. Part of the oxygenated effluent is cled back into the mixing tank, and excess ygenated effluent is removed from the resid tank. (Kramer-FIRL)
W76-02205

SEPTIC TANK TEE,
E. J. Maroschak.
United States Patent 3,904,228, Issued Septe 9, 1975. Official Gazette of the United St Patent Office, Vol 938, No 2, p 676, Septem 1975, 1 fig.

Descriptors: *Septic tanks, *Patents, *Sew disposal, *Waste disposal, Equipment, W water treatment.
Identifiers: *Septic tank tee.

A septic tank tee adapted for use with a septic was patented. It is formed of plastic, and ha elongate tubular body with open opposite ends a relatively short tubular branch member, with open opposite ends. One end of the br member is secured to the body member betw its ends and perpendicular to it. The bra member carries a split collar to aid in ancho the tee in operative position to the septic tan operative position the tee's body member wi upright within the tank and its branch member extend through an opening in the tank's side The end of the split collar closest to the b member will extend out from the branch mem and will engage the septic tank's outer wall. split collar has an outer circumferential extent responding to the outer circumference of branch member which carries it, and it is sec to the branch member. (Beale-FIRL)
W76-02207

SURFACE VENTILATION ROTOR,
J. R. Kaelin.
Canadian Patent 972, 485, Issued August 5, 1 Patent Office Record, Vol 103, No 31, p 85-86, gust, 1975.

Descriptors: *Patents, *Aeration, *Oxyg *Waste water treatment, Equipment, Mixing.
Identifiers: Surface aeration rotor.

A survey aeration rotor has been patented for ding oxygen or an oxygen mixture into wa water to be clarified. Equipment includes at l two annular blade sets, an inner blade set and outer blade set, each including several bla These define the outer and inner fluid chann The sets are concentric and a dividing wal located between the blade sets. The innerm channels are curved within vertical planes so the waste water entering the inner channels fr below is deflected within these channels though angular displacement of about 90 degrees. Wa water than emerges from the periphery of the ro in an almost horizontal direction. The outer ch nels are inclined vertically upward and radia outward; waste water entering these outer ch nels from below is conducted so that it emer from the periphery of the rotor in paths which tersect the horizontal exit paths of the inner ch nels. Thus, intensive mixing of the waste water iting from the fluid channels takes place. (Kram FIRL)
W76-02209

SLUDGE DEWATERING PROCESS AND A PARATUS,
S. A. Degremont.

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ralian Patent 463,062, Issued July 17, 1975.
ial Journal of Patents, Trade Marks and
gns, Vol 45, No 25, p 2805, July, 1975.

riptors: *Patents, *Dewatering, *Waste water
nent, *Liquid wastes, Suspended solids,
ns, Waste disposal, Equipment.
ifiers: Endless screen belts.

ent has been issued for a process to dewater
ng liquids which contain suspended solids
ater. The effluent is passed onto the top sur-
of an endless screen belt which has openings
to retain the suspended solids. Free water
s through the belt, and conveys the partially
tered material. The top of the screen belt is
to a moving capillary belt with pores sized so
develop a capillary force with respect to the
ining water in the liquid. This liquid material
rther dewatered; the capillary belt is re-
dly diverted away from the moving screen
nd the absorbed water is squeezed out of the
ary belt each time. The dewatered material is
ferred from the screen belt to a roller for sub-
nt discharge into a container. (Kramer-
)
02210

ALLATION FOR SEWAGE TREATMENT,
ne Industrial, Inc., Edina, Minn. (assignee).
Cherne, H. C. Grounds, and H. O.
orson.
ed States Patent 3,905,904, Issued September
975. Official Gazette of the United States
t Office, Vol 938, No 3, p 1235, September,
1 fig.

riptors: *Sewage treatment, *Waste water
ment, Treatment facilities, Activated sludge,
ts, Equipment, Sludge, Settling basins.

tent has been issued for a sewage treatment
ty. The installation is an open topped ac-
ed sludge sewage aeration treatment channel
a bottom and sides which form an endless
d loop path. This path provides a variable
ne activated sludge treatment reservoir for
ining and treating a biological mixed liquor.
e is a device for delivering partially treated
ge into the activated sludge treatment
ber at one location along the path at variable
ne rates. The delivery rates usually cor-
nd to the normal variations in volume rates at
h the raw sewage is received. The sewage is
nuously circulated with activated sludge as
d liquor in one direction around the closed
path in the channel at a linear rate of flow
h will prevent settling out of suspended solids
e channel. The mixed liquor is passed to a
e settling tank at a relatively constant rate by
ding device. The volume rate will be at least
to the average of the variable volume rates at
h the sewage is delivered to the activated
e treatment reservoir. The mixed liquor is
rated into sludge and remaining clear liquid ef-
t in the sludge settling tank. Overflow means
rovided for feeding the mixed liquor from the
nent channel to the sludge settling tank at a
r rate than normal whenever the depth of the
r in the channel exceeds a given maximum
(Orr-FIRL)
02211

ER AUGERING MACHINE,
rimary bibliographic entry see Field 8G.
02212

HOD AND APPARATUS FOR CESSING REFUSE, SEWAGE AND/OR TE MATERIAL INTO A SOURCE OF RGY,
ckman, J. V. McKeever, H. F. Ferguson, and
Sotak.
ed States Patent 3,910,775, Issued October 7,
Official Gazette of the United States Patent
e, Vol 939, No 1, p 323, October, 1975, 1 fig.

Descriptors: *Patents, *Dewatering, *Waste disposal, Recycling, Fuels, Sewage *Waste water treatment, Filtration, Equipment, Suspended solids.
Identifiers: *Refuse.

A system has been patented for the processing of refuse and sewage into a stable fuel material. Collected heterogeneous refuse is collected, and ferro-magnetic objects are separated out. The collected refuse is then shredded; waste is added; and the mixture is compressed, dewatered, and fed to a filtration system. Raw sewage is passed through the filter bed where solids, matter in suspension, and precipitates are filtered from the raw sewage by filter briquettes. Expended filter briquettes are removed from the filter bed, and these are dewatered and made into pellets. Waste is than mixed with the pellets, and the entire mixture is again compressed, dewatered and briquetted into a form of fuel. (Kramer-FIRL)
W76-02214

PLANT FOR WASTEWATER TREATMENT,
FMC Corp., San Jose, Calif.
Q. L. Hampton, and E. J. Matras.
Canadian Patent 974,336, Issued September 9, 1975. Patent Office Record, Vol 103, No 36, p 74, September, 1975.

Descriptors: *Patents, *Waste water treatment, *Tanks, *Aeration, Sludge treatment, Separation techniques, *Treatment facilities, Biological treatment, Equipment.
Identifiers: Modular settling tanks.

A patent has been issued for a waste water treatment facility. Equipment is provided for converting a basic unitary tank structure into a series of communication treatment zones. This is achieved by introducing a self-supporting modular settling tank with liquid fillable fillets as part of the structure. Thus the member may be anchored in position, providing watertight tank member segments which operate as cooperative treatment zones. The modular tank member provides the basic support structure for the aeration system required to convert an adjacent tank segment into an aeration zone. It also effects the removal of sludge separated in the modular tank member from mixed liquor received from the aeration zone. Therefore, part of the sludge can be returned to the aeration tank and the remainder discharged to any additional treatment zones. (Kramer-FIRL)
W76-02215

MINI SEWAGE TREATMENT SYSTEM,
D. H. Call, E. L. Atwood, J. A. Cary, and J. D. Surette.
United States Patent 3,914,173, Issued October 21, 1975. Official Gazette of the United States Patent Office, Vol 939, No 3, p 1461, October, 1975, 1 fig.

Descriptors: *Patents, *Waste water treatment, *Irradiation, *Biological treatment, *Sewage treatment, Sedimentation, Odor, Aeration, Ultraviolet radiation, Filtration, Water reuse.

A treatment method for raw sewage has been patented. The sewage is passed to a primary digestion tank where it is digested by bacterial action. From the primary digestion tank, the sewage is conducted to a second stage digestion tank to obtain more complete bacterial action and further digestion. The digested product is selectively passed from the second tank alternately through one of two strainers composed of plastic screening material with approximately a one fourth inch mesh. The product from the strainers is then passed to each of three settling tanks for a predetermined amount of time, permitting any remaining sediment to settle to the bottom of the tank. A portion of the product from the settling tanks is returned to the primary digestion tank for recirculation at predetermined intervals. The settling tanks product is selectively passed to one of two filtering and odor neutralizing cells in an alternate sequence, which is controlled according to the fluid conducting conditions of the cells. From the filtering and odor removal cell, the product than passes to an aeration-radiation unit, where it is broken up into minute particles and treated with sterilizing ultra-violet radiation. The resultant product is a reusable odorless liquid. (Kramer-FIRL)
W76-02216

TWO CITIES TEST REVERSE OSMOSIS SYSTEM.
The American City and County, Vol 90, No 9, p 122, September, 1975.

Descriptors: *Sewage disposal, *Pilot plants, *Reverse osmosis, *Calfornia, *Irrigation, Salinity, Water purification, Waste water treatment, Recycling, Water reuse.
Identifiers: Salt removal, Waste water reuse.

A pilot project for the removal of salts from treated waste water is being developed by the cities of Escondido and San Diego, California. Secondary sewage effluent (about 150,000 gpd) from the Escondido southside water reclamation facility had been limited in use to pasture irrigation because its dissolved salt content was 1550 ppm. With this system, a reverse osmosis method will reduce the salinity by 95% to approximately 75 ppm. The treated water will be recombined with conventional effluent to produce a mixture suitable for irrigating plants and shrubs with low to moderate salt tolerance. The cities plan to use the water to irrigate a golf course and other areas in the Escondido Kit Carson Park. Other reverse osmosis systems have been successful in California industrial plants. One such example is the Burroughs Corporation in San Diego, which has reduced its water purification costs by 75% with a 50,000 gpd reverse osmosis system. (Kramer-FIRL)
W76-02217

INVESTIGATION OF THE HYDRAULICS OF HORIZONTAL DRAINS IN PLUMBING SYSTEMS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 8B.
W76-02218

CURRENT TRENDS IN PACKAGED WASTEWATER TREATMENT FACILITIES, PART II,
New Jersey Inst. of Tech., Trenton. Dept. of Civil and Environmental Engineering.
R. Dresnack, and W. Miller.
Water and Sewage Works, Vol 122, No 9, p 96-99, September, 1975, 11 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Aeration, Biological treatment, Anaerobic conditions, Aerobic conditions, Economics, Installation, Oxygen, Oxidation, Disinfection.
Identifiers: Packaged treatment plants, Chemical treatment, Physico-chemical treatment.

A state-of-the-art review of package waste water treatment is presented, including performance data and a selction guide. Extended aeration activated sludge is described; the main components of an extended aeration plant are the bar screen, comminutor, aeration tank clarifier return sludge pump, aerobic sludge digester, and chlorination facilities. Two types of package aeration plants are illustrated. Such package plants can offer the flexibility of many types of combinations of aeration volume and clarifier sizes, for more economical installation. A variation, the Oasis Process, uses pure oxygen in place of air to aerate the mixed liquor. Another package process, the Bio-Disc system, has been designed and fabricated in modules for both package and separate component treatment plants. One type of Bio-Disc plant is

described, which uses a combination of aerobic and anaerobic treatment processes. Other packaged systems are of the chemical and physico-chemical types. Chemical treatment of waste water requires that chemicals react with each other and with the constituents of waste water to produce a flocculant precipitate and thus will either: increase the sedimenation rate; release oxidizing ions to oxidize the organic matter; or kill organisms to disinfect the waste water. (See also W76-00272) (Kramer)FIRL)
W76-02219

METROPOLITAN OPERATED DISTRICT FOR SEWAGE EFFLUENT-IRRIGATION WATER EXCHANGE,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, and K. J. DeCook.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 94-98. 1 fig, 1 ref.

Descriptors: *Water reuse, *Irrigation water, *Water conservation, *Water supply, *Water sources, Sewage treatment, Reclaimed water, Arizona, Water utilization, Planning, Water wells, Irrigation wells, Water management(Applied), Alternative planning, Alternative water use, Groundwater.
Identifiers: Tucson(Ariz).

A plan for the reuse of sewage effluent is proposed for the city of Tucson, Arizona. Several kinds of use would be possible, but utilization for irrigation of existing farmland in the Avra-Marana area seems particularly attractive for several reasons: (1) conveyance can be accomplished by gravity flow, (2) no tertiary treatment is required for the presently grown crops, (3) the nutrients in the effluent would be better used, and (4) effluent use would reduce the pumpage of high quality groundwater, conserving it for municipal or other uses. An exchange of wastewater for groundwater for use in the city system is seen as a good alternative to the present practice of the city purchasing farmland in Avra Valley in order to acquire the groundwater for conveyance to the Tucson basin. Objectives to maximize the quantity and efficiency of wastewater use may not appear compatible with the profit maximization motive of the individual farmer, and suitable provisions will have to be written into wastewater sales agreements to assure coordination between user and supplier. (Robinett-Arizona)
W76-02228

WATER RESOURCE ALTERNATIVES FOR POWER GENERATION IN ARIZONA,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 3E.
W76-02243

METHOD AND APPARATUS FOR THE DISINFECTION OF LIQUIDS BY ANODIC OXIDATION AND PRECEDING REDUCTION,
Sachs-Systemtechnik G. M. b. H., Schweinfurt (West Germany), (assignee).
For primary bibliographic entry see Field 5F.
W76-02251

SLIME INHIBITOR FOR USE IN INDUSTRIAL WATER RECIRCULATING SYSTEMS,
J. Tuomarla, K. Raisanen, and A. Arvinen.
U.S. Patent No 3,910,839, 3 p, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 1, p 341, October 7, 1975.

Descriptors: *Waste water treatment, *Patents, *Water purification, *Industrial water, *Inhibitors, *Recirculated water, Slimes, Fungicides, Bactericides, Chemical reactions, Pulp and paper industry.

When selecting a suitable inhibitor for the treatment of recirculated waters, the primary considerations are the toxicity of the agent, its stability, its ease of application, and its effect on a maximum number of different micro-organism species. Particularly important is the effect of the agent on the maximum number of different species of bacteria, yeast and mold fungi and algae encountered in practice, since in case the effect of the utilized agent with respect of some species is clearly low, these resistant species may be enriched in the system under treatment. This invention relates to a method of inhibition of slime formation in industrial water recirculating systems by treating the systems with 5-nitrofurfurylalcohol, optionally together with further micro-organism inhibitors. These substances are particularly applicable for the recirculated water in the pulp and paper industry. For the effective use of the substances they must be converted into water soluble or easily dispersible form. For such purposes various inorganic and organic acids and aliphatic or aromatic solvents can be utilized. When desired, a small amount of surfactive agents may be added to the solution. (Sinha-OEIS)
W76-02253

METHOD AND APPARATUS FOR TREATMENT OF LIQUID WASTES,
Nittetsu Chemical Engineering Co. Ltd., Tokyo (Japan). (Assignee).
M. Akune, and K. Yoshii.
U. S. Patent No 3,912,577, 5 p, 2 fig, 17 ref; Official Gazette of the United States Patent Office, Vol 939, No 2, p 919, October 14, 1975.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, *Industrial waste, *Organic wastes, Waste disposal, Evaporation, Incineration, *Liquid wastes.
Identifiers: High-temperature exhaust gases.

A method and a system is disclosed for treating liquid waste containing a mixture of organic and inorganic substances or organo-metallic compounds by dehydrating, concentrating and combusting it and recovering the ash produced as a slurry, and utilizing the high temperature combustion exhaust gases for concentrating additional waste. The heat evolved from the waste and from the auxiliary fuel is recovered in the form of steam, which is then utilized for reducing the water content of the waste, thus saving in auxiliary fuel consumption. A part of the combustion exhaust gases having temperatures of over 800 deg C is directly injected into a water-containing recovery vessel and any inorganic substances and any ash such as sodium carbonate contained in the exhaust gases are recovered in the form of a slurry, while the remaining part of the exhaust gases is directly contacted with the waste to evaporate the water in the waste and concentrate it. (Sinha-OEIS)
W76-02261

APPARATUS FOR AND A METHOD OF PURIFYING WASTE FLUID,
United States Steel Corp., Pittsburgh, Pa. (Assignee).
W. Didycz, and D. Glassman.
U.S. Patent No 3,912,578, 9 p, 5 fig, 2 tab, 19 ref; Official Gazette of the United States Patent Office, Vol 939, No 2, p 919-920, October 14, 1975.

Descriptors: *Patents, *Waste water treatment, Water purification, Water quality control, Water pollution control, *Desalination processes, Separation techniques, Condensation, Water reuse, Equipment.
Identifiers: Coke processing plants.

This invention provides an improved (frontw and backward flow) apparatus for and method purifying waste fluid containing waste water a corrosive salts with waste steam from a co quenching apparatus to produce substantially p salt free condensate. The method consists vaporizing a portion of the waste fluid and conc trating the corrosive salts in the residual wa fluid to form a concentrate, heating the conc trate in heat exchange relationship with either h temperature steam or the waste steam; vaporiz a second portion of the concentrate and conc trating the corrosive salts to form a second c centrate; condensing the second vaporized port and the steam to form substantially salt free c densate; and utilizing the substantially salt f condensate in an industrial application. T eliminates the disposal of waste fluid and the c tamination of the atmosphere, if the waste fl were employed to quench the coke in the c quenching apparatus and thus utilizes the wa steam. (Sinha-OEIS)
W76-02262

CLEANING OF MEMBRANE SURFACES,
Universal Oil Products Co., Des Plaines, (Assignee).
For primary bibliographic entry see Field 3A.
W76-02263

METHOD FOR REMOVING AND DECOLOR ING AQUEOUS WASTE EFFLUENTS CO TAINING DISSOLVED OR DISPERSED C GANIC MATTER,
Energy Research and Development Administ tion, Washington, D.C. (Assignee).
F. N. Case, and E. E. Ketchen.
U. S. Patent No 3,912,625, 4 p, 5 tab, 7 ref; Offi Gazette of the United States Patent Office, 939, No 2, p 931, October 14, 1975.

Descriptors: *Patents, *Waste water treatme *Industrial wastes, *Water pollution contr *Water quality control, *Adsorption, Liq wastes, Separation techniques, Organic mat Radiation, Radioisotopes.
Identifiers: Regeneration.

A method is disclosed which remo chromophoric organic matter from an aque waste effluent by sorption on a carbonaceous s bent while concurrently regenerating the sorb and converts colored organic compounds i colorless or less colored form. The process is co prised of mixing an aqueous waste effluent c taining dissolved or dispersed chromophoric ganic matter with a carbonaceous sorbent of character described while irradiating the efflue sorbent mixture with high energy radiation. In context of this invention, high energy radiat means that form of radiation which has the capa ty to destroy or convert organic compounds c taining chromophoric groups into colorless or le colored form. In this invention cobalt-60, gamma-emitting isotope, is used as an effect source of high energy radiation. Other function equivalent radiation sources may be used to pr tice this invention, such as Cs-137, Ce-134, Ir-1 and Eu-152, 154. (Sinha-OEIS)
W76-02264

FLUID TREATMENT APPARATUS,
E. L. Karlson.
U.S. Patent No 3,912,636, 5 p, 6 fig, 12 ref; O cial Gazette of the United States Patent Offi Vol 939, No 2, p 935, October 14, 1975.

Descriptors: *Patents, *Waste water treatme *Industrial wastes, *Sewage treatment, Water p lution control, Water quality control, Separati techniques, Ion exchange, Resins, Equipme Pollution abatement.
Identifiers: Endless belt.

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nvention provides apparatus by which d materials may be removed from fluid traveling along a flow path. Separation place when an endless foraminous belt through the flow path. The belt contains ed bag-like containers made of fluid perme-aterial adapted for containing ion exchange ls and arranged on the surface of the belt s peripherial length. (Sinha-OEIS)
266

OCCULATION AND THE ACCUMULA-OF CHEMICALS BY FLOC-FORMING NISMS,
ate Univ., Columbus. Dept. of Microbiolo-

igan.
le from the National Technical Informa-rvice, Springfield, Va. 22161. Environmen-ection Agency, Report EPA-600/2-75-032, ber 1975. 136 p, 51 fig, 21 tab, 100 ref. EPA , 17050 DFJ.

tors: *Activated sludge process, ption, Microbiology, Bacteria, *Colloids, *Radioactive wastes, Waste disposal, e treatment, Aerobic bacteria, *Sludge, pollution, Sewage treatment, Coagulation, c compounds, Pesticides, Slime, Sedimen-

ers: Systematics, Flocculating gels.

floc-forming bacteria were isolated from l water. All organisms studied produced llular polymer fibrils that were related to natrix and flocculation. The extracellular rs have high adsorption capacity for: solu-al and other mineral ions, soluble organic s (BOD), soluble toxic organics, insoluble particles and insoluble organic particu-he bacteria remove BOD by physical ad-n as well as by oxidative metabolism and nvert oxygen demanding organics to more llular polymer. Production of polymer can ulated nutritionally to yield amounts that aste treatment - pollution abatement poten-a commercial scale. The relationship of culation to waste treatment and lake ication is discussed and the basic ism of bioflocculation is considered. nical activities of individual floc-forming examined because of its relevance to r synthesis. Taxonomy of floc-formers is nsidered in relationship to biochemical ac-(EPA)
267

REMENT OF ACTIVE BIOMASS CON-ATIONS IN BIOLOGICAL WASTE MENT PROCESSES,
Inst. of Tech., Atlanta. School of Civil ring.
hland, and S. J. Kang.
le from the National Technical Informa-vice, Springfield, Va 22161. Environmen-ection Agency, Report EPA-600/2-75-029, ber 1975. 140 p, 42 fig, 41 tab, 72 ref, 4 ap-PA 1BB043 (ROAP 21-ASR, Task 008).

tors: *Enzymes, *Biological treatment, Pollutant identification, Activated sludge, ement, *Biomass, Cultures, *Bioassay, water treatment.
ers: Active biomass, *Dehydrogenase ac-

earch was initiated to determine the ap-ty and limitations of the dehydrogenase the measurement of active biomass in al wastewater treatment processes. Pure with E. coli and/or heterogeneous culture udies were conducted on a variety of sub-including glucose, galactose, sucrose, acetic acid, and selected industrial waste-Also conducted were continuous aerobic or anaerobic culture studies with and without solids recycle. Dehydrogenase activity was monitored along with other parameters including plate count, Coulter Counter enumeration, adenosine triphosphate (ATP), and suspended solids to provide comparative and complementary information on the biomass concentration. Dehydrogenase activity was a very sensitive and accurate measure of active biomass throughout the growth phases especially during endogenous growth but showed limitations with the nutrient deficient cultures. The correlation between dehydrogenase activity and suspended solids was constant at varying retention times, or at all growth rates with or without solids recycle. Consequently, a standard curve could be developed for given wastewaters by operating the measurement of active biomass and thereby effectively controlling the biological process. The measurement of ATP was also a reliable new technique for measurement of active biomass except more study on the extraction method is required as well as investigations on the change of the correlation with suspended solids with the change of growth rate. The technique for dehydrogenase activity measurement is simple, less costly and gives more reliable and interpretable results. (EPA)
W76-02268

FOOD FROM SEWAGE. IT CAN BE DONE,
Carnegie-Mellon Univ., Pittsburgh, Pa.
L. J. Young, and J. C. Purcupile.
Water and Wastes Engineering, Vol 10, No 5, p 47-50, June, 1973. 3 fig, 3 tab.

Descriptors: *Sewage, *Yeast, *Pilot plants, *Waste water treatment, *Sewage treatment, Bacteria, Fermentation, Economic feasibility, Disinfection, Nutrients.
Identifiers: Food supplement, Saccharomyces cerevisiae.

The feasibility of a process in which yeast could be grown on sewage, thereby recovering some of the nutrients that are lost and selling the yeast to offset some treatment costs, has been studied. The yeast, Saccharomyces cerevisiae, could be used as cattle fodder, for feeding game fish in either hatcheries or open waters, and possibly as a direct food supplement in foreign countries. A pilot plant was designed to simulate the production of yeast on a large system. Sewage is heated between 180 F and 200 F in a 20-gal reservoir to dissolve some of the solid organic nutrients. The sterilizer, a 16 quart pressure cooker heated with a 750 watt hot plate, reduces the bacteria count in the sewage to zero. The sterilizer is operated at 10 psi above the saturation pressure for water at 260 F to insure that vaporization does not occur during the sterilization process. A batch fermentation process is used to minimize the complexity of the pilot system. It consists of two 30-gal tanks, one mounted above the other. The upper tank is the holding tank and its contents are emptied periodically into the lower tank, the fermentor where sewage is fermented for 24 to 48 hours. The fermentor empties into 5-gal containers where the yeast is centrifugally separated from the growth media. The control system, consisting of a fermentation cycle timer, monitoring equipment, and safety system, allows the pilot plant to operate with only periodic monitoring and can shut down the plant in the event of a malfunction. The economic feasibility of the process is dependent on the yeast yield. If the yield is at least one percent by weight, then the system is economically attractive. (Sandoski-FIRL)
W76-02291

ANAEROBIC DIGESTION OF DAIRY FARM SLURRY,
Surrey Univ., Guilford (England). Dept. of Biological Sciences.
C. Bell.
Effluent and Water Treatment Journal, Vol 13, No 4, p 232-233, April, 1973. 2 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Anaerobic digestion, *Dewatering, Dairy industry, Sampling, Oxidation, Acids, Pilot plants.

A pilot scale anaerobic digester has been designed and constructed to evaluate operating parameters for a digester treating dairy farm slurry. The digester at Merrist Wood Agricultural College, England, has been operating since January 1973. Tests performed on samples from the feed mixture, the digester, and the primary oxidation tank included permanganate value, dewaterability, pH using wide range pH indicator papers, and volatile fatty acid analyses. The acetic and propionic acid levels in the digesting material increase during the acid phase of digestion; isobutyric and butyric acids also appear in this phase. No acids are detectable in the secondary tank indicating a rapid decrease in volatile acids in the presence of air. The semi-continuous digestion process reduces the permanganate value by 25 to 33% of the original value. The dewaterability value increased from greater than one hour to 45 seconds after digestion. These results demonstrate that an efficient anaerobic system is operating within the digester. (Sandoski-FIRL)
W76-02292

TREATS HUGE FLOWRATES,
D. E. Henke.
Food Engineering, Vol 45, No 6, p 70-71, June, 1973. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Biological treatment, Food processing industry, Trickling filters, Plastics, Flow rates.
Identifiers: *Flocor, Milk plant wastes, Potato processing waste water.

A biological treatment tower, used extensively in Europe and proven effective in treating milk plant wastes and potato waste water, works on biological and physicochemical principles similar to those in trickling filters. However, hydraulic loads 10 to 15 times greater than in trickling filters are permitted by the system's 97% void ratio. The rigid vinyl plastic packing is lightweight, durable, inert, dimensionally stable, and immune to bacteriological attack. Modules of the material with a surface area per unit volume of 29 sq ft/cu ft are placed at right angles to the one below it. The size, shape, and regular arrangement of voids formed between flat and corrugated sheets of packing provide an optimum combination of air-liquid flow and surface area for bios growth. (Sandoski-FIRL)
W76-02293

ENVIRONMENTAL SYSTEMS LABORATORY.
Consulting Engineer, Vol 40, No 6, p 90-91, June, 1973. 2 fig.

Descriptors: *Food chains, *Treatment facilities, *Waste water treatment, *Tertiary treatment, *Sewage treatment, Shellfish, Agriculture, Algae, Nutrients, Cooling water, Thermal powerplants, Design criteria, Laboratories.

The Environmental System Laboratory at Woods Hole, Massachusetts, has been designed to simulate on a realistic scale the environmental conditions and interaction of a natural food chain. It will allow demonstrations of tertiary sewage treatment system made economically feasible by the production of food. The project will demonstrate on a significant scale a tertiary sewage treatment system linked with use of cooling water from nuclear and fossil fuel thermal powerplants, for widespread coastal-zone application. Oysters, clams, mussels, and scallops will be fed with micro-algae grown in seawater with nutrients from secondary sewage treatment. Aquatic animal wastes will be removed by macro-algae in a settling basin. The physical set-up consists of concrete raceways and lined algae ponds, various water conditioning control and product handling facilities, a laboratory for specialized small-scale testing, and pipelines for

ambient and heated seawater, secondarily treated sewage, compressed air, and algae. (Sandoski-FIRL)
W76-02294

TRAVELING BELT FILTER TACKLES WASTE-WATER.
Food Engineering, Vol 45, No 6, p 78, June, 1973. 1 fig.

Descriptors: *Waste water treatment, *Food processing wastes, *Filtration, *Dewatering, Sludge treatment, Equipment.
Identifiers: Brewery wastes, Sludge dewatering filter.

A sludge dewatering filter which uses a molded deck fitted over a drum to produce relatively dry solids for convenient disposal is described. The design allows access to all filtrate passages to facilitate cleaning and maintenance. There are no internal filtering components in the drum. It has external filtrate channels, removable flush-out plugs, and external pipes and valves. This filter has been used at a brewery for dewatering diatomaceous earth, carbon black, and other beer filtering wastes. Solids can be dewatered to 35 percent dryness. (Sandoski-FIRL)
W76-02295

REMOVES MOISTURE FROM WASTE PRODUCTS.
Food Processing Industry, Vol 42, No 498, p 28, April, 1973. 1 fig.

Descriptors: *Waste water treatment, *Food processing industry, *Sludge treatment, *Drying, Evaporation, Evaporators, Centrifuges.
Identifiers: Meat industry wastes, *Evaporative-drying techniques.

The Carver-Greenfield process, suitable for treating meat industry wastes, is designed to remove all moisture from sludges and other waste products. The oil-based evaporative-drying technique is odorless, creates no air or stream pollution, and produces dry, sterile solids of uniform consistency which can be burned as as boiler fuel, stored without decomposition, or bagged and marketed. The system can handle nontreated waste or raw sludge directly from primary and/or secondary treatment. Processing is unaffected by high percentages of solids, fats, or oils. Resultant solids may be reclaimed or burned to generate steam and electric power to run the system. The process is continuous and fully automatic. All available water from solutions, slurries, and sludges can be removed and purified, resulting in the elimination of waste water disposal problems. The three basic components of the system are a fluidizing tank, an evaporator, and a centrifuge. Additional units are added as necessary for each situation. The choice between multi-stage and single-stage drying evaporators depends on cost factors. (Sandoski-FIRL)
W76-02296

OVERCOMES PHOSPHATE PROBLEM,
McCombs-Knutson Associated, Inc., Minneapolis, Minn.
W. H. McCombs, and K. L. Van Aacken.
Food Engineering, Vol 45, No 6, p 72-73, June, 1973. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Food processing wastes, *Biochemical oxygen demand, *Phosphorus, Lime, Polyelectrolytes, Chlorine, Nutrient removal.
Identifiers: *Cheese processing wastes.

Increased cheese production and a change in effluent standards has prompted Bongards Creameries to employ biological and chemical treatment processes to reduce BOD from 1700 mg/liter to 55 mg/liter and phosphorus from 35 mg/liter to 4.7 mg/liter. In the process, lime is added at a point just beyond the settling tank. Lime raises the pH to 9.5-12, causing the phosphorus in solution to form an insoluble precipitate. Adding a polyelectrolyte causes the precipitate to agglomerate and form large clumps of material which settle out. This settled material is disposed of by lagooning. About 500-600 pounds of lime per day and one mg/liter of the polyelectrolyte are used. Flow is about 150,000 gpd. To reduce BOD in the two existing treatment ponds, two 30 hp Mixco Lighting platform aerators were added to the second pond. A by-pass was also added to permit effluent to go directly to the second pond. A section of the effluent pond was divided by steel sheeting installed to form a settling tank. The bottom of this settling area was covered with concrete grouted over a rock fill. Sludge is removed from the bottom of the settling area and returned to the incoming flow. After the settling area, waste is treated with lime and polyelectrolyte. The treated waste passes through a clarification chamber over the weir into a two cell contact tank. Necessary pH adjustments are made and chlorine is added to the second cell to meet coliform requirements. From here the wastes go to a ditch where they mix with cooling water. (Sandoski-FIRL)
W76-02297

WASTEWATER TREATMENT AT FORD'S WINDSOR COMPLEX,
Ford-Windsor Complex (Ontario).
S. H. Vaughn, and R. S. McCurdy.
Industrial Wastes, Vol 19, No 3, p 34-36, 38, 40, 43, May/June, 1973. 3 fig, 6 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Treatment facilities, Oil, Suspended solids, Phenols, Oily water.
Identifiers: *Automotive industry.

The principal pollutants at Ford's Windsor Complex are oil, suspended solids, and phenol traces. The water treatment program designed to handle them involves segregation of specific waste streams, change and control of processes, and installation of treatment facilities which could operate over a wide range of conditions. The Windsor oily waste treatment process consists of three 200,000 gal waste treatment batch tanks equipped with acid proof linings, air mixers, and oil skimming troughs. Skim oil, from the treatment tanks, is directed to two 10,000 gal steam heated tramp oil tanks where oil is concentrated and passed to a 10,000 gal storage tank. Water, separated from the tramp oil, is returned to the waste treatment plant influent wet well while the tramp oil is burned with primary fuels. The casting plant waste water is first directed to two slag pits equipped with dragout flights which provide a short settling time to allow heavy slag particles and gritty material to settle. The waste water is then conveyed to the clarifiers wet well where two 7600 gpm constant speed mixed flow vertical pumps lift the waste water to a flow splitter chamber. Sedimentation occurs in two 110-foot diameter clarifiers with 25 x 8 foot center flocculating zones. The clarifier detention time is 3.8 hours with a weir overflow rate of 2500 gpd/lf. One measure to minimize the phenols at casting plants is to purchase coke which has not been quenched with phenolic bearing water. Process equipment operating with phenolic materials for binders has been redesigned to collect dust with dry air pollution control equipment. Phenolic-based paints have been eliminated and use of phenolic biocides in coolants minimized. (Sandoski-FIRL)
W76-02298

CONTINUOUS PRINTED CIRCUIT ETCHING-WITHOUT POLLUTION,
Pennwalt Corp., Warminster, Pa. Sharples-Stokes Div.
W. F. Gilliland.
Products Finishing, Vol 37, No 9, p 89-91, June, 1973. 3 fig.

Descriptors: *Waste water treatment, *Indu wastes, *Chemical wastes, Copper, Centri tion, Sludge, Economics, *Recycling.
Identifiers: Circuit board printing.

A major electronics producer is converting gallons of liquid waste copper salts from et circuit boards, into a saleable chemical. Th being done using the FMC 'Caper' pro 'Caper' uses ammonium persulfate as the etc Copper sulfate and ammonium sulfate are fo as copper is etched away. When an etching tion containing these salts is cooled, copper monium sulfate hexahydrate precipitates, an salts may be removed by centrifuging. The ples centrifuge is operated at 2600 rpm to pro a moist sludge which is in heavy plastic lined board cartons. The centrifuge discharges a 130 pounds of spent salt per hour, conta about 20 pounds of copper. The sludge is sol its copper content, about 4 cents per pou sludge. (Sandoski-FIRL)
W76-02299

FLUIDIZED-METAL TRAPS METAL.
Chemical Engineering, Vol 80, No 13, p 78, 11, 1973. 1 tab.

Descriptors: *Waste water treatment, *Indu wastes, *Heavy metals, Mercury, Cadm Chromium, Lead, Pilot plants, Waste disposal, Recycling.
Identifiers: Electrochemical stripping.

Mercury, cadmium, chromium, lead, and metals are being successfully removed from i trial waste water. A fluidized bed of condu particles across which a low-voltage direct cu is applied causing metallic impurities to plat on the bed particles. Chemical or electroche stripping can be used to recover the heavy wastes and to regenerate the bed. The pretreatment necessary is adjustment of the water pH to about 7. The system works suc fully even at low concentration levels. It is being used in a pilot plant unit. The conduc requirements for the process have not been r determined, but is is known that the same re can be obtained with a lower electrolytic co tivity by increasing cell voltage or decre cathode-collector-anode spacing. Test result dicate that 100 to 200 ppm of dissolved salts vide adequate conductivity. The proposed ment system would feed brine (4300 lons/minute) plus washwater (400 gallons/mi to five parallel cells, each capable of handling gallons/minute. The cells would decrease the centrations of copper and other heavy meta levels that would eliminate tubing erosion and mit disposal of the desalting plant effluent int sea. (Sandoski-FIRL)
W76-02300

LOW COST CHLORINATION SYSTEM.
Food Engineering, Vol 45, No 6, p 76, June, 1 fig.

Descriptors: *Waste water treat *Chlorination, Equipment, *Water treat Water levels, Weirs, Automation, Automatic trol, Mixing.

A self-regulating maintenance-free system chlorination has been designed for p processing up to 100,000 gal/day. It consists non-mechanical chlorinator using a sani agent in tablet form. The system may be us add chlorination to existing plants, to replac isting chlorination units which may troublesome or costly to operate, or it can b corporated into new plants. The simple, one- construction of the chlorinator necessitates inlet piping with no electrical power, w bypasses, or other piping. The entire plant passes through the chlorinator. Unique weir trol of water level ensures complete mixin chlorine and waste water. (Sandoski-FIRL)

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ESS WATER REUSE AND CONTROL AT SC MILL,
Bay Packaging, Inc., Wis.
Nelson, G. O. Walraven, and D. C. Morris.
Trade Journal, Vol 157, No 24, p 32-33, June
3.

tors: *Waste water treatment, *Industrial *Pulp and paper industry, Reverse osmo-ter reuse, Separation techniques, Wiscon-

ers: Green Bay(Wisc).

Bay Packaging Incorporated operates a sulfate semi-chemical pulp and paperboard the Fox River at Green Bay, Wisconsin. y of the pulp mill is 200 tons per day of base NSSC pulp. Preliminary investigation se osmosis indicated that it was economi-portant to reduce the waste water volume. se of waste water was investigated through l substitution of clarified excess white or fresh water on paper machine showers, ubsequent continuing program of further on, entrapment, and reuse. The goal of the is to control the variable losses that are ed to upset conditions with resultant ion of the discharges to the river. White euse includes not only the major replace-city water by clarified white water on the e showers, but also many lesser substitu-such as in consistency regulators, and hoses. Fresh water inputs such as pump al water were adjusted to the lowest practi-. In reaching the present point of equilibri-white water soluble solids content rose 9 to 3.7 percent, the temperature of the ystem rose from 130 F to 160 F, and the of medium comprising most of the produc-unchanged. The increase in solubles con-the white water used in the digester and jections resulted in improved efficiency of solids separation at the presses, and reflect ase in strong liquor soluble solids from 13 rcent. (Sandoski-FIRL)
302

TION FREE MILLS: FACTS AND VI-

ers Ingenjoersbyra A.B. Alingas (Sweden).
kander.
rade Journal, Vol 157, No 26, p 31, June

tors: *Waste water treatment, *Pulp and dustry, *Industrial wastes, Water pollu-urces, Biochemical oxygen demand, research, Water pollution control.
rs: Sweden.

edish pulp and paper industry is the main of water pollution in the country. In 1970, from the mills accounted for 20 to 25% of ntry's total emission of BOD into water Improving this situation, assessing and iating the available information on possi-sures for environmental conservation, and ng the development projects concerned vironmental protection are the goals of ition project being conducted over a ar period under the auspices of the indus-hods proposed involve the following mea-osure of cooking, screening, and washing which account for 30 to 50% of the e; use of oxygen bleaching for waste use; refinement of the evaporator opera-void foaming over; recommendation of for handling and possibly eliminating spil-other occasional discharges; introduction ds for collecting and disposing of sludge ling ponds; and, application of computer es for regulating the recovery boiler so as ntain optimal operating conditions. i-FIRL)
03

STABILIZING THE PURIFIED WATERS GENERATED BY THE ETCHING SHOPS FOR THEIR UTILIZATION IN THE REVERSE CYCLE (STABILIZATSIYA OCHISHCHENNYKH PROMYVNYKH VOD TRAVIL'NYKH OTDELENIY DLYA ISPOL'ZOVANIYA V OBOROTNOM TSIKLE),
V. I. Aksenov, Z. Ye. Elik, and K. D. Belousova.
Vodosnabzheniye i Sanitarnaya Tekhnika, No 4, p 4-5, 1973. 2 fig, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Water reuse, Metals, *Recycling, Neutralization, Flocculation, Sludge treatment, Dewatering.
Identifiers: Etching shop wastes, Metal industry.

A process for the removal of excess calcium sulfate from etching shop-generated, neutralized effluents for use in the recycling process has been developed. Waste water containing sulfuric acid and iron salts is neutralized with slaked lime, after which the excess gypsum is removed by seeding with 15% gypsum pulp added at the expenditure of water (0.05-0.6 grams per liter). Following seeding in a flocculating chamber under permanent agitation for 30 to 40 minutes, the neutralized and seeded water is sent to a settler from which the sludge is removed for mechanical dewatering, and the stabilized water, possibly after final treatment, is mixed with fresh water for recycling in the etching process. (Sandoski-FIRL)
W76-02304

A COMBINED METHOD FOR THE PURIFICATION OF FLUORINE FROM INDUSTRIAL WASTE WATERS GENERATED BY A SUPERPHOSPHATE PRODUCING PLANT (KOMBINIROVANNYY METOD OCHISTKI FTORA IZ PROIZVODSTVENNYKH STOCHNYKH VOD SUPERFOSFATNOGO ZAVODA),
I. M. Garibov, and A. A. Mamedov.
Azerbaidzhanskiy Khimicheskiy Zhurnal, No 4, p 135-136, 1973.

Descriptors: *Waste water treatment, *Chemical wastes, *Industrial wastes, Chemical precipitation, Lime, Fluorine, Adsorption.

The removal of fluorine compounds in waste water from superphosphate manufacturing plants to the maximum allowable level has been accomplished. Fluorine compounds can be removed from such waste water by precipitation with slaked lime in the form of calcium fluoride, and by adsorption on aluminum sulfate gel or on iron sulfate gel at the moment of formation. Fluorine concentrations up to one gram per liter in such effluents can be easily removed by the addition of 4 grams of aluminum sulfate or iron sulfate, 6 grams of lime, and 0.005 grams of polyacrylamide per liter. (Tacaks-FIRL)
W76-02305

TWO-STAGE BIOLOGICAL SYSTEM CUTS SPACE.
Modern Power and Engineering, Vol 67, No 6, p 40-41, June, 1973, 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Biological treatment, Aeration, Microorganisms, Equipment, Activated sludge.

A two-stage biological reaction system for treating wastes at National Starch and Chemical Company Limited's plant at Collingwood, Ontario, has been very successful. The system replaced the original trickling filter system, permitting compliance with the town's sewer by-law. The two-stage biological reaction system has reduced by two-thirds the total aeration tank capacity required by a single-stage installation. The two-stage system has also reduced microorganism loss during occasionally severe winter conditions. An important part of the design was to provide aeration equipment capable of economically meeting the present varying oxygen demands, yet suitable for future expansion. Two Lightnin submerged-turbine aerators, driven by two-speed motors, plus a compressed air system provide this capability. The waste flow can be fed to an aeration tank or by-passed depending on BOD loading. The normal flow pattern is for the wastes to pass through each tank in series. Following aeration, the waste flow is clarified before being passed to the secondary stage where the aeration and clarification steps are repeated. Activated sludge is cycled back or pumped from the secondary clarifier to an aerated sludge holding tank for eventual disposal. (Sandoski-FIRL)
W76-02306

COAL FINES RECOVERED FROM WATER BY FROTH-FLOTATION.
Industrial Water Engineering, Vol 10, No 3, p 6, May-June, 1973, 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Coals, *Froth flotation, Filtration, *Patents, Separation techniques, Recycling.
Identifiers: *Coal fines recovery.

A patent has been granted for a method of separating and recovering fine particles of coal from water. The method involves use of a froth-flotation process to treat the water-coal slurry. The fine particles of coal are floated out in a froth, which is created by adding a reagent to the slurry, and recycled to the filter where the coal is recovered. The remaining water in the froth-flotation cells contains less than 0.1% of fine particles of coal. (Sandoski-FIRL)
W76-02307

PEACHES DRY-PEELED AT DEL MONTE.
Industrial Water Engineering, Vol 10, No 3, p 6, May-June, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Peaches, Fruit crops, Water conservation, Water utilization, Biochemical oxygen demand, Suspended solids.

Dry peeling of peaches can cause major savings in water usage. This has been demonstrated by running a full-scale commercial line in parallel with a conventional unit to compare dry peeling methods with the common wet processing system. Water usage was reduced from 850 gallons per ton for conventional peeling to 90 gallons per ton for dry peeling. BOD and suspended solids in the liquid wastes were reduced from 70 to 55 percent. (Sandoski-FIRL)
W76-02308

DETERMINING THE CHEMICAL OXYGEN DEMAND (COD) OF AN INDUSTRIAL EFFLUENT. COMPARISON OF DIFFERENT METHODS PROPOSED WITH SPECIAL REGARD TO CERTAIN SUBSTANCES CONTAINED IN CANNED FOOD INDUSTRY GENERATED WASTE WATERS (DETERMINAZIONE DELLA DOMANDA CHIMICA DI OSSIGENO (COD) DI UN EFFLUENTE INDUSTRIALE. CONFRONTO TRA I VARI METODI PROPOSTI CON PARTICOLARE RIFERIMENTO ALLE SOSTANZE CONTENUTE IN ALCUNI SCARICHI DELLE INDUSTRIE CONSERVIERE).
Industria Conserve, Vol 48, No 1, p 19-23, January-March, 1973. 7 tab, 35 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Food processing industry, *Canneries, *Chemical oxygen demand, Biochemical oxygen demand, Measurement, *Pollutant identification.
Identifiers: Permanganate value.

Investigations for a substitute for the biochemical oxygen demand (BOD) determination in waste

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water resulting from food processing industries have included the study of correlations between the former and chemical oxygen demand (COD) or permanganate value (PV). Procedures used in the determination of COD included the potassium dichromate, potassium permanganate, potassium iodate, and ceric sulfate methods. The approach using potassium dichromate in strong acid solutions appeared to be the most effective in application. The correlation between these two parameters is valid, however, only when applied to water featuring similar characteristics. The dichromate procedure is quick and very useful during the water treatment plant design stage. It also provides the possibility of detecting sudden variations in the pollutant load of an effluent associated with specific stages of the industrial process. (Takacs-FIRL)
W76-02309

THE CLARIFICATION PLANT OF THE CHEMICAL COMPLEX OF THE TOWN JAMBOL (DIE ABWASSERREINIGUNGSANLAGE DER CHEMIEKOMBINATS DER STADT JAMBOL),
J. Diadowski.
Wasser und Boden, Vol 25, No 5, p 141-142, 1973. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Treatment facilities, Biochemical oxygen demand, Activated sludge, Neutralization, Sludge treatment, Lagoons.
Identifiers: Synthetic fiber production wastes, *Bulgaria(Jambol).

A waste water treatment plant for a synthetic fiber manufacturing complex in Jambol, Bulgaria, has been designed for a waste water capacity of about 60 cu m/hr with an average BOD value of 1320 mg/liter. The system comprises a neutralization unit, an activated sludge basin with pH adjustment, a final purification step, a sludge thickener, a lagoon, and a diluting unit in which the treated water is diluted with fresh water to limit the BOD to 50 mg/liter. The effluent to be sent into the activated sludge basin is first combined with phosphoric acid and carbamide to increase its nutrient content. A considerable increase in the treatment plant load and subsequently in the recycled sludge index and BOD value, due to plant expansion, was determined. The sludge index, exceeding 100 ml/gram against a nominal range of 20-60 mg/liter, can be made normal by the addition of aluminum sulfate and calcium hydroxide. (Takacs-FIRL)
W76-02310

REMOVAL OF BENZIDINE FROM INDUSTRIAL WASTE WATERS, (DEKANTSEROGENIZATISIYA PROMYSHLENNYKH STOCHNYKH VOD, SODERZHASHCHIKH BENZIDIN),
V. A. Genin.
Gigiyena i Sanitariya, No 3, p 105-107, 1973.

Descriptors: *Waste water treatment, *Chemical wastes, Separation techniques, Chemical reaction, Public health, *Industrial wastes.
Identifiers: *Carcinogens, *Benzidine, Bis-diazodiphenyl.

A method for the removal of carcinogenic benzidine from benzidine sulfate-containing waste water generated by a benzidine manufacturing process has been developed. Both filtrate and benzidine sulfate-contaminated waste water are sent first into a settler for the separation of suspended solids. The waste water, diluted with fresh water, is then sent into a diazotization apparatus in which a 20-percent solution of sodium nitrite is added for the conversion of benzidine sulfate into bis-diazodiphenyl. This product has yet to be proven carcinogenic. (Takacs-FIRL)
W76-02311

COMPLETE REUSE OF TEXTILE DYEING WASTES PROCESSED WITH DYNAMIC MEMBRANE HYPERFILTRATION,
Clemson Univ., S C. Dept. of Textile
C. A. Brandon, J. S. Johnson, R. W. Minturn, and J. J. Porter.
Textile Chemist and Colorist, Vol 5, No 7, p 35-38, Jul., 1973. 3 fig, 4 tab, 11 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Membrane processes, Separation techniques, Dyes, Color, *Water reuse, *Recycling.
Identifiers: *Hyperfiltration, Synthetic fibers production.

Hyperfiltration through dynamically formed dual-layer hydrous Zr(IV) oxide polyacrylate membranes on porous ceramic and carbon tubes removed greater than 85% of the organic carbon from the effluent from a textile finishing plant processing most synthetic fibers. Production rates were 40 to 80 gpd/sq ft at 1000 psig and 60 C. Color rejection was greater than 99%. Eighty-seven percent water recovery was achieved without deterioration of membrane performance. The purified product and the concentration residue from the treatment of the dye waste have been directly reused in critical test dyeings. The reuse of chemicals in the product and/or residue may provide an important economic advantage. Since the waste water can be treated at process temperatures the reuse of hot water will also reduce costs. (Sandoski-FIRL)
W76-02312

ELECTROCHEMICAL PROCESS FOR EFFLUENT,
J. G. Noble.
Process Biochemistry, Vol 8, No 6, p 19-20, 34, June, 1973. 1 fig, 80 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Electrochemistry, Electrodes, Effluents.
Identifiers: *Electro-M-process, *Electrochemical treatment.

An electrochemical process for the treatment of highly polluted effluents is discussed. This process, known as the Electro-M-process, includes the following general details. Effluent from the works is pumped from a buffer reservoir to the reactor basins of an Electro-M plant. The discharge pump from the buffer reservoir can be provided with minimum and maximum contacts; the contacts can control the starting and termination of the treatment. In each reactor basin there are motor-driven stirrers for mixing the sludge. Electrodes in the basins are arranged such that one anode is situated between two cathodes. All electrodes are in plate form and are suspended vertically downwards into the effluent from supports fixed to the reactor basin. The spacing of the electrodes is controlled to ensure that the voltage is not affected. Normal depth of the reactor basin is about 1.5 meters. The system can measure flow, pH, and conductivity at the inlet, and Redox-potential, voltage and current in the reactor basins, as well as oxygen, pH, and turbidity in the discharge. (Sandoski-FIRL)
W76-02313

MASSIVE LIME TREATMENT COLOR REMOVAL FROM KRAFT EFFLUENTS,
International Paper Co., Mobile, Ala.
R. S. Wright.
Paper Trade Journal, Vol 157, No 24, p 29-30, June 11, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Pilot plants, Lime, Cost, Color, Louisiana.
Identifiers: Bleached kraft pulp wastes, Decolorization.

A demonstration plant has been constructed ternational Paper Company's mill at Spri Louisiana, for the decolorization of kra fluents. The plant designed to treat 530 gpm fluent using 20 thousand ppm of lime, operated from February 1970 until August The major difference between the massive process evaluated in this project and e processes is in the amount of lime used. The sive lime process employs a excess of li produce a heavy and readily settleable sludge massive lime system cannot be operated as a treating plant clarifying a given flow and a organic load but must be able to fluctuate variation in the mill's production. Massive treatment can remove more than 90% of the bodies contained in effluents from the b caustic extraction stage and the final unble pulp washing stage. These two stages contribu to 75% of the total color load produced i manufacture of bleached kraft pulp. Massive treatment in the pulp mill's liquor caustic operation will dilute the cooking liquor. Thi increase the volume of liquors handled throu the pulp mill's processes necessitating inc capacity in most of the chemical preparatio recovery equipment. For a typical thousan per day mill using the massive lime system to four million gallons of effluent per day, the will be approximately $1.80 per ton of blea pulp, based on current raw material and ut costs. (Sandoski-FIRL)
W76-02314

TREATABILITY STUDIES AT A PROCESSING PLANT, PART TWO,
Environmental Protection Service, O (Ontario).
M. J. Riddle, and K. L. Murphy.
Water and Pollution Control, Vol 111, No 6, 35, June 1973, 3 fig, 2 tab, 11 ref.

Descriptors: *Waste water treatment, * processing wastes, *Fish handling faci Biological treatment, Flotation, Biochemica ygen demand, Suspended solids, Sedimentati
Identifiers: Fish processing waste water.

Batch biological studies have been conducte waste water from perch and smelt proce Sampling and analysis of the contents of the reactors were performed daily. The batch rea were filled with 15 liters of fish waste and 2 of liquor from an aerated lagoon. Stickliquo added to the reactors to determine its effect o biodegradation of the waste. The additio stickliquor did not change the order of the va reactions monitored. Following batch studies tinuous reactors having detention times of 7. 15 hours, 5, 10, and 15 days were employed. T 10, and 15 days detention time reactors ha sludge recycle and the sludge age equaled th tention time. The 7.5 and 15 hour detention reactors initially had a three-day sludge age v was subsequently increased to five days. I studies showed that within ten days 90% of BOD had been removed, as well as approxim 70% of the soluble organic carbon. The assoc BOD removal rates were about 10% per day addition of stickliquor decreased the remova both BOD and total organic carbon (TOC creased residual BOD and TOC concentra were observed even after 20 days of degrad The continuous reactors showed that maxi treatment of the combined waste water cou obtained in a reactor with a detention time gr than five days with no sludge recycle or a sho tention time (7.5 hours) with sludge recycle maximum removal of total BOD was 50% a filtered TOC, 80%. (Sandoski-FIRL)
W76-02335

TREATMENT OF SULFITE EVAPORA CONDENSATES FOR RECOVERY VOLATILE COMPONENTS,
Institute of Paper Chemistry, Appleton, Wis.
K. W. Baiere, B. F. Lueck, and A. J. Wiley.

Vol 56, No 7, p 58-61, July 1973, 8 fig, 1 tab.

ptors: *Water pollution control, Recycling, ants, Pulp and paper industry, Biochemical demand, Chemical oxygen demand, liquors, Waste treatment, Activated car-

iers: *Paper mills, Sulfite evaporator con-es.

omplementary projects for the removal of nts from sulfite evaporator condensates valuated separately and combined. The pilot et up in the mill consisted of: a system com- steps of steam stripping, activated carbon tion, and fractional distillation; and a based on a low-temperature (200 C), ther- egenerated activated carbon adsorption n. Operation of the first system showed that dioxide, methanol, furfural, and acetic acid be recovered as relatively pure materials, xcellent reduction in the COD and BOD of ndensate. Water of a purity suitable for in the mill was obtained. Operation of a tory- sized column of the second system in- l that the carbon may be used through at l cycles. (See also W74-09066 and W74- (Sandoski-FIRL)
2336

ORT CENTRALIZES TREATMENT OF STRIAL WASTES,
lswood Development Co. Bayport, Tex.
Monaghan, and D. Simmons.
Engineering-ASCE, Vol 43, No 6, p 85-88, 973, 3 fig, 2 tab.

iptors: *Waste water treatment, *Industrial s, *Treatment facilities, Equalization reser- Activated sludge, Chlorination, Incinera- Water pollution control, Texas, Monitoring.

vy industrial complex at Galveston Bay, rt, Texas has been developed. Eighteen in- es that operate facilities there are regulated vernment environmental agencies, and have pollution control standards as part of their rty deeds. A centralized waste treatment has been created, which went on-stream in and takes liquid wastes from all 18 plants and them in a common facility. The advantage is ital outlay for individual treatment facilities, nly one discharge permit being required. The rs pay for amortization and operating costs. s from each industrial plant are separated three streams: clean stream; biological n; and incinerable wastes. Each is treated isposed of appropriately. Criteria for ac- ble materials for biological treatment and for ration are outlined. Monitoring, treatability lividual and combined waste waters is con- ly improved in response to new processes xpansions. (Kramer-FIRL)
02337

T PULP AND PAPER MILL POLLUTION EMENT, MODERINIZATION, AND EX- ION.
lting Engineer, Vol 40, No 6, p 94-95, June 2 fig.

iptors: *Waste water treatment, *Industrial s, Pulp and paper industry, Color, Water , Recycling, Biochemical oxygen demand, iana, *Pulp wastes.
ifiers: *Unbleached kraft pulp wastes, chemical pulp wastes.

Continental Can Company of Hodge, Loui- , has initiated modernization and expansion tter water pollution control at an unbleached and semi-chemical pulp and paper mill. A scale color removal system was designed criteria established in laboratory and pilot facilities. New standards for unbleached waste effluent treatment were also developed. Existing waste water treatment facilities may now handle the double plant capacity, after water consumption reduction by 30% through recycling and utilization of the color removal system to further reduce BOD in the waste effluent. High efficiency air emmission control systems were selected and permit the reduction of 55% and 30% of 1969 particulate and odorous emissions. Initial operation has been successful, particularly the color reduction in the waste effluent. Effluent BOD was also within the required levels. The total investment necessary was determined to be less than two-thirds the cost of constructing a new plant of equal capacity. (Sandoski-FIRL)
W76-02338

TEXTBOOK ROUTE STOPS MERCURY LOSS.
Canadian Chemical Processing, Vol 57, No 6, p 50, June 1973, 1 fig,

Descriptors: *Waste water treatment, *Industrial wastes, *Mercury, Chlorine, Chemical precipitation, Filtration, Chemical wastes, *Recycling.
Identifiers: Chlor-alkali plants, Mercury recycling.

The release of mercury to the environment has been controlled at a chloralkali plant of FMC of Canada by a simple, chemical add-on process. All mercury-bearing liquid wastes are sent to a concrete pit where sodium sulfide is added. This precipitates soluble mercury in the waste water as insoluble mercury sulfide. The extremely dilute slurry from the pit is then filtered to remove mercury sulfide and other solids. The filter cake is collected and held for futher processing. All solid wastes are treated to solubilize the mercury compounds in them. The HgS filter cake is combined with muds from the brine-treating clarifier. These solids react with caustic and chlorine in an agitated vessel. The resultant slurry is filtered, and the mercury-rich filtrate is recycled to the electrochemical cells. There it is reduced to elemental metallic mercury and returned to the moving mercury cathode at the base of the cell. Since the patented process has been in use at the chlorine plant, the total mercury discharge in both liquid and solid wastes has averaged less than 1.5 pounds per week. (Sandosk--FIRL)
W76-02339

WASTE WATER COOLANT.
Engineering News-Record, Vol 191, No 12, p 14, July 12, 1973.

Descriptors: *Waste water treatment, *Cooling water, *Water resue, Tertiary treatment, Lime, Oxidation, Denitrification, Phosphorus, Heavy metals, Biochemical oxygen demand, California.

Construction is planned for a 30 mgd tertiary waste water reclamation plant to supply coolant water for five industrial users at Suisun Bay, San Francisco. The five companies (Phillips Petroleum Company, Shell Oil Company, Stauffer Chemical Company, Monsanto Company, and a Pacific Gas and Electric Company power station that serves Shell) will be linked to the plant by four miles of existing pipeline. The system could potentially be extended to another 20 to 30 industrial users. The treatment process combines lime treatment with oxidation and denitrification. Sand and grit are first screed from in-coming waste; lime is used to cause phosphorus, heavy metals, and other solids to sink to the bottom of the sedimentation tank. The liquid then enters an aeration and nitrification tank where bacteria and microorganisms feed an oxygen-demanding materials. In subsequent processing stages, nitrogen compounds are converted to nitrogen gas, which in turn is released by bubbling air through the liquid. Process testing resulted in 99% BOD removal. Phosphorus and nitrogen were reduced to 0.5 and 2 ppm, respectively. (Sandoski-FIRL)
W76-02340

NEW FILTER PRESS ENHANCES SLUDGE DEWATERING KNOWHOW.
Chemical Engineering, Vol 80, No 16, p 46, 48, July 9, 1973. 2 fig.

Descriptors: *Waste water treatment, *Sludge treatment, *Dewatering, Filtration, Equipment, New Jersey.
Identifiers: *Filter presses.

A filter press for sludge dewatering that produces filter cakes with a solids content of 35 to 60% (compared with 25% or less for conventional methods) has been developed by the Nichols Engineering and Research Company of New Jersey. The unit's efficient dewatering is achieved by a new filter-plate design. Cylindrical-shaped pips or protrusions characterize the unique plate surface. Because of their geometry and distribution, only one-third of the plate is needed to support the filter cloth. The remainder is left free for more-efficient filtrate drainage. The plates are unaffected by acid or other washes, and cleaning time can be reduced by in-place removal of carbonate deposits from the filter cloths. The filter press may be operated through its entire cycle--loading, filtering, dumping, and reloading--with a single lever. Moving it one way retracts the moving end of the press, and at the same time activates a plate-shuttling mechanism so that freed cake can drop out unassisted. The filter press is available in a traditional square configuration and also in a space-saving rectangular style (72 x 48 inches). Operating pressures are generally in the 50 to 100 psi range. (Sandoski-FIRL)
W76-02341

ROTATING BIOLOGICAL SURFACE.
Industrial Water Engineering, Vol 10, No 3, p 48, May-June, 1973.

Descriptors: *Waste water treatment, *Biological treatment, Equipment, Costs, Trickling filters, Activated sludge, Biodegradation, Microorganisms.
Identifiers: *Rotating biological surface(RBS).

A rotating biological surface (RBS) waste treatment process has been shown to be more effective and less costly than the trickling filter and many activated sludge processes. The RBS is a series of closely-spaced vertical discs, mounted on a horizontal, externally-driven shaft. The shaft is supported by bearings and is slowly rotated, alternately exposing the disc surfaces to the waste material and then to the air. The waste liquid is slightly less than half the disc diameter. Waste material containing bacteria continuously flows parallel to the discs, forming a growth. The growth produced is a uniform biologic mass which covers the disc surface evenly. Contact between the waste material and the biomass is provided by multi-directional flow through the biomass during exposure to the waste liquids. The stablized biomass on the discs oxidizes the waste material into metabolic byproducts and excess cell material. Process advantages include: low installation, operating, and maintenance costs; resistance to hydraulic shock loads; resistance to organic shock loads and toxic spills; and, minimal process control requirements. (Sandoski-FIRL)
W76-02342

THE PURIFICATION PLANT OF THE ANIMAL FLAYING STATION IN ICKER-AN EXAMPLE FOR THE POSSIBILITIES OF THE ACTIVATION PROCESS AND FOR THE APPLICATION OF PACKED TOWERS WITH SYNTHETIC PACKING ELEMENTS (DAS KLAERWERK DER TIERKOERPERVERWERTTUNGSANSTALT IN ICKER-EIN BEISPIEL FUER DIE MOEGLICHKEITEN DES BELEBUNGSVERFAHRENS UND FUER DIE DES EINSATZES VON TROPFKOERPERN MIT KUNSTSTOFFFUELLELEMENTEN),
H. Neumann.

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Berichte der Abwassertechinschen Vereinigung E.V., No 25, p 294-311, 1972. 8 fig, 12 ref.

Descriptors: *Waste water treatment, *Food processing industry, Trickling filters, Biological treatment, Biochemical oxygen demand, Pre-treatment.
Identifiers: *Slaughterhouse wastes, Plastic media, West Germany.

The waste water purification process used at an animal plant in Icker, West Germany, is a trickling filter with a plastic foil packing material. This is used as the first biological stage in which a BOD decrease of 70-80% is achieved, through 5- to 6-fold recycling, at a load of 2-3 kg BOD per cu m day. The water from the trickling filter is further purified in a second, fully biological stage. In principle, it is possible to efficiently purify these effluents by means of a single, low-load biological stage, and to reduce the specific pollutant load of such effluents by up to 50% through adequate technological modifications. The second biological stage has a satisfactory efficiency despite a phosphorus deficit of 60 to 70%. However, very high ammonium nitrogen and nitrite nitrogen contents in the second biological stage lead to considerable inhibition of the organic matter decomposition. To reduce these contents, chemical pretreatment is necessary. (Takacs-FIRL)
W76-02344

NEW WESTINGHOUSE PLANT PRODUCES COMPLETE LINE OF WATER AND WASTE-WATER TREATMENT EQUIPMENT.
Water and Sewage Works, Vol 120, No 5, p 54-56, June 1973. 4 fig.

Descriptors: *Water treatment, *Waste water treatment, Equipment, Industrial production, Marketing, Planning, Transportation, Treatment facilities.

The Infilco Division of Westinghouse Electric Corporation is operating a facility built exclusively for the design and fabrication of many types of water and waste water treatment equipment. The plant can produce treatment equipment for industrial, municipal, electric utility, and marine applications. In-house fabrication ability allows for substantial control of product quality, scheduling, and shipping. The location of this plant, at the center of the East Coast's business, and supply markets for water and waste water treatment equipment, is ideal. Access is easy to interstate highway and rail facilities, particularly to the ports of Norfolk, Virginia, and Baltimore, Maryland, which simplifies overseas shipment. Products may be shipped by rail or truck according to the customer's preference. Products are shipped either assembled or disassembled, depending on size and/or customer preference. (Sandoski-FIRL)
W76-02345

TREATING EFFLUENT IN MIDLANDS FACTORY.
Metal Finishing Journal, Vol 19, No 221, p 174, June 1973.

Descriptors: *Treatment facilities, *Metals, *Waste water treatment, Effluents, Pumps, Suspended solids, Sulfur compounds, Nitrogen compounds, Installation, Tanks, Flocculation, Coagulation, Industrial wastes.
Identifiers: *Metalic wastes, Nitric acid, Sulfuric acid, England.

An effluent treatment plant has been installed by High Duty Alloys Limited, Smethwick, England. The plant will handle liquors arising from the etch shop process, and will treat a continuous flow of up to 2000 gal/hr of a mixture of metals, sulfuric and nitric acids, and a caustic solution. To ensure that an average strength effluent is fed forward for treatment, processing wastes are pumped by separate pumps, one for alkali, the other for acid, to respective holding tanks where they are blended with the metallic wastes. Mixed effluent is then pumped by one of two transfer pumps to the neutralization tank. The pH is adjusted by dosing with milk of lime solution until it is in the range 8-9. Treated effluent flows by gravity to the control feed well of the settlement vessel in which coagulation and flocculation of the suspended matter occurs, thus improving the settling characteristics of the solids and suspended matter in the effluent. These solids and suspended matter settle out under gravity and collect in the conical section of the settlement vessel. The resultant, clear, supernatant liquid overflows a peripheral weir and flows to the drain. (Sandoski-FIRL)
W76-02346

REACTION OF NON-CYANIDIC METAL COMPLEXES TO CONVENTIONAL DECONTAMINATION OF WASTE WATER FROM ELECTRO-PLATING (DAS VERHALTEN NICHT-CYANIDISCHER METALLKOMPLEXE BEI DER HERKOEMMLICHEN ENTGIFTUNG VON GALVANIKABWAESSERN),
R. Wagner.
Vom Wasser, No 39, p 263-286, 1972. 16 fig, 2 tab, 11 ref.

Descriptors: *Heavy metals, *Waste water treatment, *Chemical precipitation, Organic compounds, Industrial wastes.
Identifiers: *Electroplating wastes, Organic complex-builders, Metal complexes.

Results of an investigation to decrease the amount of heavy metals in waste water from electroplating plants are reported. The use of organic complex-builders indicated that rinse or bath liquids containing the sequestering agents ethylene diamine, tartaric acid, triethanolamine, and gluconic acid, should not be mixed with cyanide bearing waste water or jointly treated. Separate treatment will prevent an excess of complex-builder from attracting the suspended metallic hydroxides formed by treating cyanide complexes with hypochlorite and not yer freed through precipitation. (Nave-FIRL)
W76-02347

EFFLUENT TREATMENT PLANT.
Metal Finishing Journal, Vol 19, No 221, p 176, June 1973.

Descriptors: *Treatment facilities, *Effluents, *Waste water treatment, Industrial wastes, Sulfur compounds, Automation, Control systems, Filtration.
Identifiers: *Sulfuric acid, Pickle liquors, Metal wastes.

An effluent treatment plant has been designed and installed by Head Wrightson Process Engineering Limited. The facility neutralizes a maximum flow of 15,000 gal/hr of spent pickle liquors containing 5000 ppm of sulfuric acid or the equivalent concentration of hydrochloric acid. Automatic control is designed to enable the plant to deal with a variation in flow from 2000 up to 15,000 gal/hr. Neutralization is achieved using the carbonate process whereby acidic wastes flow upward through a stirred bed of 1/4- to 3/8-inch limestone chippings. Carbon dioxide is removed by passing the neutralized liquor through a bank of aeration cells. Conventional clarification and filtration follow, prior to effluent discharge. (Sandoski-FIRL)
W76-02348

THE PRECIPITATION OF LEAD FROM WASTE WATERS (DIE AUSFAELLUNG VON BLEI AUS ABWAESSERN),
L. Hartinger.
Metalloberflaeche, Vol 27, No 5, p 157-159, May, 1973.

Descriptors: *Chemical precipitation, *Lead, *Waste water treatment, Flocculation, Polymers, Adsorption, Industrial wastes.
Identifiers. Metal wastes.

The feasibility of lead precipitation from water solutions by means of sodium hydr calcium, and sodium carbonate has been s Simple neutralization by means of sodium h ide or calcium was not found suitable f precipitation of lead from solutions when c trations reached 100 mg/liter. However, th concentration can be lowered to below 0.4 by the use of soda for neutralization at a pH adjusted to 7-8 with the addition of comounds in amounts of 10-30 mg/liter and amounts of a polyacrylamide-base flocculan it is possible that inorganic acids present solution can be bound by sodium hydroxide neutralization, provided the pH value is low 5. The resulting precipitate adsorbs the soluble, finely dispersed lead carbonate and rapidly after addition of the organic floc (Tackas-FIRL)
W76-02349

STEEL MILL WASTE LINE PROTE WITH EPOXIES.
Water and Sewage Works, Vol 120, No 7, p July, 1973. 4 fig.

Descriptors: *Waste water treatment, *Trea facilities, *Industrial wastes, Waste di Lake Michigan, Lagoons, Rivers, Pipelines struction materials, Steel pipes, Water trea Concrete, Indiana.
Identifiers: Steel industry wastes, E discharges.

Bethlehem Steel Corporation has constru new waste treatment plant at Burns Harbor ana. This facility collects and treats ind wastes before discharging the acceptable ef into the Little Calumet River and subseq into Lake Michigan. A cold mill industrial line carries the dilute acidic rinse water ov from sheet and tinning operations and pick the secondary waste treatment plant. Foll several mechanical and chemical proc stages, the treated effluent discharges into s lagoons before returned to the Little C River. The water treatment facility includes feet of steel pipeline, 59 reinforced concrete holes, and two concrete scalping tanks, which are protected with higher perfor epoxy coatings. Over the past eight-plus periodic inspection of the pipe linings and co coatings has revealed excellent adhesion t steel and concrete with no major signs of f (Sandoski-FIRL)
W76-02350

CHROMIC ACID SYSTEM RECL MATERIAL, SOLVES PLATING PLANT LUTION PROBLEMS.
Modern Power and Engineering, Vol 67, N 46-47, June, 1973. 1 fig.

Descriptors: *Waste disposal, *Treatment ties, *Industrial wastes, Ion exchange, R Flow, Recycling, Chromium, Metals, water treatment, Canada, Metals.
Identifiers: *Chromic acid, *Metal wastes.

Chromic acid reclamation is being implemen solve waste disposal problems and to reduce for Industrial Electro-Plating Limited, To Canada. The plant has the first installation new Eco-Tec recovery system for waste ch acid, based on the ion exchange principle compact recovery system recovers more tha percent of the chromic acid from the plating waters and allows it to be returned to the pr The unit also removes undesirable metallic in ties, and the recycled chromic acid allows th trolyte to work more effectively than the o bath. Reciprocating flow ion exchange is u the system to reclaim the chromic acid. Th combines the use of three short ion exc

ne containing anion resins and the other ntaining cation exchange resins. Rinse nd chromic acid operate in a closed loop, current ion exchange. Thus, the recovered c acid is much more concentrated than that d with conventional ion exchange systems. legradation due to chromic acid attack also le effect on operation of the reciprocating ion exchange systems. (Sandoski-FIRL)
351

L PLATER RECOVERS TOXIC IONS.
an Chemical Processing, Vol 57, No 57, p July, 1973.

ptors: *Filtration, *Waste water treatment, ical precipitation, Treatment facilities, Fil-Capital costs, Operating costs, Metals, , Nickel, Chromium, Zinc, Recycling, oxicity.
iers: *Metals recovery, Electroplating , Metal wastes.

Wallaceburg, Ontario plant, National Hard-as installed recovery equipment to clean up uents to less than 17 ppm iron and one ppm per, nickel, chromium, and zinc. To meet equirments, a waste treatment system was ed, employing selective precipitation and n filtration, to treat wastes generated in its nical finishing and electroplating facilities. iltration facility was designed and con-d to process up to 48,000 gpd with ded solids loadings from less than 10 ppm to l thousand ppm. The filtration facility con-f two vacuum filters, each with 700 square f filter area. The filters are interconnected n be operated individually or together as one quare foot unit. The facility was designed to ize both capital and operating costs. No abor or body feed are required to maintain it and no flocculating agents are used. The ives attained to data have ranged up to four s. (Sandoski-FIRL)
2352

R-REDUCIBLE COATING SOLVES LEMS.
rial Finishing, Vol 19, No 8, p 42-44, Au-973. 3 fig.

ptors: *Steel, *Industrial production, Odor, e water treatment, Water pollution abate-Connecticut.
iers: Hardware manufacturing wastes, g materials.

tanley Works, New Britain, Connecticut, a are manufacturing, has solved the environ-l problem in the coating of steel shelf ts by converting a dip system from solvent-to water-reducible enamel. Advantages by the changeover include: an 87% drop in t emission; dramatic decrease in solvent elimination of a fire hazard; simplified p; reduction with tap water; and, improved roperties. The change was made on a com-onveyor line that includes a degreaser, two llon dip tanks with switching equipment to ther tank, an oven, and a stripping tank. ets coated on the line are right angle shaped, ary in size from 4- by 4- by 14-inch. oski-FIRL)
2353

ENIC PROBLEMS OF THE PROTECTION SURFACE WATERS AND MODERN NOLOGY IN INDUSTRY, (IN RUSSIAN),
ino-Issledovatelskii Institut Gigieny, ow (USSR).
Novikov, and M. M. Saifutdinov.
nit. 9 p 66-71, 1974.

iptors: Technology, *Waste water treat-Water supply, *Reviews, Industrial wastes, e water disposal, Public health.

A literature review shows that modern industrial technology based on closed water-supply cycles with the use of local treatment and additional treatment permits eliminating the disposal of wastewaters into surface waters and reducing the consumption of fresh water per unit product manufactured. Simultaneously, surface water can be considerably improved.--Copyright 1975, Biological Abstracts, Inc.
W76-02354

TREATING CONTAMINATED WATER.
French Patent FR 2149717. Issued March 30, 1973. Derwent French Patents Reports, Vol U, No 22, p D5, March, 1973.
Identifiers: *Patents, *Pulp and paper industry, *Waste water treatment, *Industrial wastes, Activated carbon, Adsorption, Tanks, Mixing.

A patent has been issued to the St. Regis Paper Company for treating contaminated water using activated carbon. The method involves continuously discharging the contaminated water into the first of a plurality of tanks while simultaneously and continuously discharging fresh powdered activated carbon into the last of the series of tanks at such a rate that a slurry density between 50 and 200 grams of activated carbon per liter the tanks is stirred and portion of the contents of each of the tanks are withdrawn. These are either substantially free from solid particles or consist entirely of solid particles. Each portion is forced successively into a consecutive tank of the series; treated water free from solid particles is withdrawn from the last tank of the series. (Sandoski-FIRL)
W76-02355

PROCESS WATER REUSE AND UPSET CONTROL MODIFICATION AT AN INTEGRATED NSSC MILL,
Green Bay Packaging, Inc. Wis. Mill Div.
W. R. Nelson, G. O. Walraven, and D. C. Morris.
Tappi, Vol 56, No 7, p 54-57, July, 1973. 8 fig, 2 tab.

Descriptors: Pulp and paper industry, Water pollution control, *Water reuse, Reverse osmosis, *Waste water treatment, Industrial wastes, Suspended solids, Biochemical oxygen demand, *Treatment facilities, Monitoring, *Pulp wastes, Wisconsin.

The pulp and papermaking operation at the Green Bay, Wisconsin, neutral sulfite semichemical mill is described. The generation and distribution of solubles in the process and excess waters of the mill are also discussed. The arrangement consists of mill sewers, recycled water flows, spill surge flow, and an internal monitoring control system. Waste water handling with a proposed reverse osmosis operation is detailed. Mill production control experience has achieved monthly average loss levels of 11.0 pounds of BOD per pulp ton and 1.7 pounds suspended solids per machine ton. The upset control system short term experience suggests that consistent loss levels of 5.0 pounds of BOD per pulp ton and 1.0 pound suspended solids per machine ton will be achieved. (Sandoski-FIRL)
W76-02356

RECOVERY PLANT RECYCLES OIL WASTE.
Secondary Raw Materials, Vol 11, No 6, p 98, June, 1973.

Descriptors: *Oil wastes, *Waste water treatment, *Recycling, Treatment facilities, Fuels, Indiana, Industrial wastes.
Identifiers: *Waste recovery, Oil recovery, Solids reclamation.

A new oil recovery plant that converts waste oil into a usuable fuel is now operating at Bethlehem Steel Corporation's Burns Harbor, Indiana, steelmaking plant. The oil recovery facility was designed to refine a minimum of 200,000 gallons per month of waste oil into fuel oil for industrial application. The new oil recovery facility was formerly the oil separation plant. Oil recycling process begins at the recovery tank station. The waste product is pumped from there to new refining facilities inside the building for water and solids removal from the oil by acid treatment, filtration, and washing in tanks. The reusable fuel is then pumped to the two large outside storage tanks. Collection of waste oil and distribution of the processed fuel are handled by tank trucks. The solids reclaimed from the oil will be stored until the sintering plant goes into operation. (Sandoski-FIRL)
W76-02358

FILTRATION KEY TO CONVERTING WASTE OIL INTO USABLE FUEL.
Filtration Engineering, Vol 4, No 3, p 14, May/June, 1973.

Descriptors: *Filtration, Oil, *Oil wastes, *Recycling, Industrial wastes, Waste water treatment, Effluents.
Identifiers: Waste oil recovery, *Oil recovery.

The Bethlehem Steel Corporation steelmaking complex at Burns Harbor, Indiana, has implemented a new oil recovery plant for the conversion of waste oil into a usable fuel. The facility will refine a minimum of 200,000 gallons per month of waste oil into fuel oil for industrial usage. Waste products from the plant are pumped to new refining areas, and water and solids are removed from the oil by acid treatment, a Komline-Sanderson filter, and washing tanks. Until Bethlehem Steel finishes a new sintering plant for recycling waste iron-bearing materials from its various production processes, the solids reclaimed from the oil are being stored. Waste water from the oil treatment process is clarified at a secondary treatment facility. From the plant, effluents flow to a newly created lagoon which will protect against the release of untreated materials into the Little Calumet River. Water flows from the river into Lake Michigan. (Sandoski-FIRL)
W76-02359

PACKING PICKLES WITH RECYCLED BRINE.
Agricultural Research, Vol 22, No 1, p 10-11, July, 1973.

Descriptors: *Food processing industry, *Waste disposal, *Recycling, Incineration, Brines, Pilot plants, California, Water reuse.
Identifiers: Combustion evaporation, Salt reuse.

The ARS' Western regional research laboratory in Berkeley, California, has developed a method for reclaiming the salt from pickling brine, thereby keeping it out of the effluent stream. A submerged combustion evaporator is used to crystallize the salt from the used brine solution. In submerged combustion, gaseous combustion products pass directly up from the burner through the brine. Heat is rapidly transferred from the rising gas bubbles directly to the brine through the bubble interface. The condensed brine, changed to a slurry form, leaves the bottom of the evaporator. It contains about 58% solids of which about 6% is combustible organic matter and must be eliminated before the salt is suitable for reuse. These organic contaminants are destroyed by incineration for five minutes at 1200F. Salt is then decontaminated except for a small amount of carbon and is ready for storage. To prepare pickling brine for the next season, the salt is dissolved in water and the carbon removed by simple filtration. The same salt can be reused for five or more seasons. (Sandoski-FIRL)
W76-02360

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REMOVAL OF ORGANIC CARBON FROM WATER BY OXIDATION WITH SOLID CATALYSTS,
California Univ., Davis. Dept. of Chemical Engineering.
J. M. Smith.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 182, $3.50 in paper copy, $2.25 in microfiche. Technical Completion Report, November 1975, 6 p. (California Water Resources Center, Davis, Project UCAL-WRC-W-392). OWRT A-051-CAL(2).

Descriptors: *Oxidation, *Chemical reactions, *Waste water treatment, *Catalysts, Technical feasibility, Economic feasibility, Kinetics, Organic wastes.
Identifiers: *Organic carbon removal, Liquid-phase oxidation, Solid catalysts, Catalytic oxidation, Trickle-bed reactors.

The purpose was to evaluate the technical and economic feasibility of liquid-phase oxidation of soluble organics in wastewaters using solid catalysts. The procedure was, first, to evaluate the kinetics of catalytic oxidation under conditions where the intrinsic activity of the catalyst could be established. With such kinetic results, the next step was to evaluate different types of reactors for practical use in removing organic pollutants from water. Results from this phase of the work would permit an economic evaluation of the process for comparison with alternative procedures, such as biological oxidation. Collective achieved were to measure intrinsic kinetics for two promising catalysts and to begin the investigation of various reactor types. The work accomplished involved analysis of the performance of trickle-bed reactors for pollutant removal. This appears to be one of the most desirable reactors. A variety of organic pollutants, including refractory acids, can be completely oxidized to carbon dioxide at temperatures of the order of 270C. Maintaining the water in the liquid phase, which requires compressing the liquid to prevent vaporatization, eliminates the energy requirements that would be associated with vaporizing the water. (Snyder-California, Davis)
W76-02364

THE POLLUTER PAYS PRINCIPLE AND TRANSITIONAL PERIOD MEASURES IN A DYNAMIC SETTING,
Oslo Univ. (Norway).
For primary bibliographic entry see Field 5G.
W76-02377

ANALYSIS OF COST SHARING PROGRAMS FOR POLLUTION ABATEMENT OF MUNICIPAL WASTEWATER,
National Bureau of Standards, Washington, D.C. Building Economics Section.
For primary bibliographic entry see Field 5G.
W76-02379

SANITARY CHARACTERIZATION OF THE SARATOV RESERVOIR IN THE REGION OF AN OIL REFINERY, (IN RUSSIAN),
Kuybyshevskii Inshonere-Stroitelayi Institut (USSR).
For primary bibliographic entry see Field 5B.
W76-02380

BACTERIAL CONTENTS OF SEWAGE FROM LARGE HOG FARMS IN ROMANIA, (IN FRANCE),
Institutul Agronomic din Timisoara (Rumania).
For primary bibliographic entry see Field 5A.
W76-02401

SOME TRENDS IN INDUSTRIAL WATER AND WASTES MANAGEMENT,
Consultancy Services Ltd. (England). Environmental Control.
M. W. Askew.
Dairy Industries (G. B.), Vol 38, No 5, p 211-216, 1973, 3 fig, 3 tab, 9 ref.

Descriptors: *Industrial wastes, *Industrial water, *Waste water treatment, *Dairy industry, Sludge, Biological treatment, Filtration, Flow control, Byproducts, Separation techniques, Sedimentation, Sludge disposal, Water reuse.
Identifiers: *Dairy wastes, England, Wales, Micellization/Demicellization, Desal process, Alwatech process.

Many on-site waste water treatment plants are being constructed by the dairy industry in England and Wales. High rate bio-filters are well suited to dairy effluents. A common system of effluent treatment consists of a combination of flow equalization with fat separation, two-stage high-rate biofiltration with solids sedimentation; low-rate biofiltration and solids sedimentation. Attention must be given to screening of solids, flow equalization of hydraulic and organic loading and cleansing and sterilizing materials, fat separation, and chemical neutralization of effluent acidity to prevent sludge bulking and fungal growth. Water and effluent quantities are reduced more readily and economically than the quantity of polluting material as effluents tend to increase in strength. Highrate biofiltration with bio-aeration may be the best treatment method. Sludge treatment is expensive, so variations of extended aeration and contact stabilization bio-aeration systems which generate minimal quantities of surplus sludge can be used. Sludge can be spread on farm land, treated with cationic polyelectrolytes, incinerated, or edible protein produced by microbial synthesis. Water reclamation and reuse are suggested. Reuse quality requirements must be objectively defined. Possible methods are membrane, ion exchange, filtration, sterilization, and micellization/demicellization. Reclamation processes must be integrated with production needs. (Buchanan-Davidson--Wisconsin)
W76-02429

UHR FILTERS TREATING MILL WASTEWATERS,
De Laval Turbine, Inc., Florence, N.J. Condensor and Filter Div.
J. T. Wallace, and J. S. Brown.
In: Proceedings of the 26th Industrial Waste Conference, May 4-6, 1971, Purdue University, Lafayette, Indiana, Purdue University Engineering Bulleting, Engineering Extension Series No 140, Part 2, p 807-814, 7 fig.

Descriptors: *Waste water treatment, *Filters, *Water purification, *Steel, Texas, Water reuse, Recirculated water, Cooling towers, Suspended solids.
Identifiers: *Ultra High Rate Filter System, Baytonw(Tex), Backwash.

Water supplies for the U.S. Steel Corporation plate mill at Baytown, Texas, are closed systems wherever possible. The Plant Mill Service Water System is a closed recirculation network with blowdown disposal. After heavy solids from mill scale wastes are removed in a scale pit, the remaining wastes plus raw water sludge thickener overflow and make-up water go to a receiving basin. Partially clarified water is pumped through an Ultra High Rate Filter System to a cooling tower, a clearwell, then to the mill for re-use. Filters of anthracite and sand remove particles 1-50 microns in size and finely dispersed oil. Filter design and operation are described. The most important factor for filtration success is a repeatable, effective backwash. An automatic backwash provides a uniform, reliable, repeatable method that is fail-safe, makes troubleshooting easy, reduces maintenance costs, and provides maximum on stream time for each filter. The system has operated since 1970 with few problems. Influents average 28.1 mg/l total suspended solids and effluents 4.4 mg/l. Effluent oil is below 5 ppm. This recirculated water system is practical under widely varying operating conditions, while maintaining recirculated water quality equivalent to or better than the quality of make-up water. (Buchanan-Davidson--Wisconsin)
W76-02434

THE APPLICABILITY OF CARBON ADSORPTION IN THE TREATMENT OF PETROCHEMICAL WASTEWATERS,
Engineering-Science, Inc./Texas, Austin.
D. L. Ford.
In: 'Applications of New Concepts of Physical-Chemical Wastewater Treatment,' W.W. Eckenfelder, Jr. and L. K. Cecil, editors. Pergamon Press, Inc., Elmsford, N.Y., 1972, p 133-149, 3 tab, 10 ref.

Descriptors: *Activated carbon, *Oil wastes, *Waste water treatment, *Industrial wastes, Water reuse, Biological treatment, Tertiary treatment, Design, Activated sludge.
Identifiers: Refinery wastes, Petrochemical wastes.

No American refineries or petrochemical facilities use carbon adsorption exclusively to treat wastes. Technical and economic justification of using carbon adsorption to treat these wastes must be based on pilot plant evaluations. The adsorption theory described by rate equations and distinct breakthrough curve geometry can apply to complex wastewaters. Carbon capacity determined from continuous-flow column studies was 10-80% greater than predicted by batch isotherm tests. Series biological-carbon systems probably are the most common carbon application for refinery/petrochemical wastewater treatment. Pilot studies indicated persistent 'leakage' of biochemical oxygen demand organics when fixed-bed carbon columns were applied as a single treatment. More pronounced breakthrough curves and smaller adsorption zone depths were observed for carbon adsorption removal of total organic carbon and chemical oxygen demand when biologically treated effluent was used as column feed compared to primary (oil separator) effluent feed. Carbon capacity in a fixed-bed column increased as influent organic concentration decreased. Breakthrough/exhaustion capacity decreased as wastewater complexity, resulting in unused carbon in the column when breakthrough occurred. Biological-carbon and total carbon systems capable of producing effluents acceptable for selective reuse providing total dissolved solids, chlorides, and certain heavy metals are not concentrated to prohibitive levels. (Buchanan-Davidson--Wisconsin)
W76-02435

SOUR WATER STRIPPER: ITS DESIGN AND APPLICATION,
Atlantic Richfield Co., Houston, Tex.
D. G. Rodriguez.
Water-1973, American Institute of Chemical Engineers Syposium Series, Vol 70, No 136, p 665-670, 1973, 2 fig, 3 tab.

Descriptors: *Acidic water, *Design criteria, *Industrial wastes, *Waste water treatment, Ammonia, Hydrogen sulfide, Sulfur, Methodology, Byproducts, Capital costs, Operating costs, Corrosion, Towers, Gases.
Identifiers: *Refinery effluents, *Stripping towers, Sulfur recovery, Atlantic Richfield, Houston Refinery.

The sour water stripper can remove as much as 50% of the oxygen consuming wastes present in refinery effluent water. Sour waters normally constitute 5-15% of the total refinery wastewater flow. The process described strips ammonia and hydrogen sulfide. Sour waters are segregated in a holding tank then fed to a stripping column using steam stripping medium. The unit will generally include a feed drum, stripping column, and associated equipment. Careful consideration must be g

ur water gathering system, design and selec-
f the sour water stripper unit equipment, cor-
n and salt deposits, and disposition of the
er overhead gas release. The disposal usually
ves ammonia recovery and acid gas feed to
lfur recovery facilities. Feeding of ammonia
the sulfur plant is less costly, but involves
ical problems. However, pilot and plant scale
s have shown good results in eliminating
er off-gas in the sulfur recovery plant's con-
section. At the Atlantic Richfield Houston
ery sour water stripper, the cost was mostly
the stripping and heating of steam fed to the
. The effect of sour waters on wastewater
y, and capital and operating costs are shown.
anan-Davidson--Wisconsin)
02436

LAMELLA SEPARATOR: A DEFINITION RESULT OF PILOT STUDIES IN THE AND PAPER AND STEEL INDUSTRIES,
Johnson Institutet for Industriforskning, shamn (Sweden).
rsell.
roceedings of the 26th Industrial Waste Con-
ce, May 4-6, 1971, Purdue University, yette, Indiana, Purdue University Engineer-ulletin, Engineering Extension Series No 140, , p 867-873, 7 fig, 1 tab.

riptors: *Waste water treatment, *Separation iques, *Industrial wastes, Pilot plants, Pulp aper industry, Steel, Pulp wastes, Gravity, ulation, Flocculation, Chemical precipita-Design data.
ifiers: *Lamella separator, Gravity flow.

amella Separators concurrent flow between ated sludge and liquid phases make possible a nclination angle and a high specific settling inclined plates). Suspensions to be separated ed to the inlet trough and pass through flow formed by the plates. Suspended matter ates on the plates and slides down to the e collector; clarified liquid is drawn off gh discharge pipes and recollected. Even distribution results because the pressure drop stly in the discharge tube. Liquid flow and ly transport sludge. This method can separate oxide type of flocs formed by chemical pitation of waste water, such as heavy metal oxides from neutralized pickling plant rinse . Pilot studies in a Swedish stainless steel mill ntegrated kraft mill are described. Chemical ulation in kraft mills is less complex and red less space than biological treatment sses. Effluents containing suspended matter possibly be treated by pure clarification and polluted effluents by coagulation-clarifica-Full scale Lamella Separators consist of a er of identical plates working in parallel. In-te clearances and inclination angles vary. city depends on settling characteristics of the nsion to be separated. Designs are given for and small flocculation separation plants. anan-Davidson--Wisconsin)
02437

ATMENT OF CHEESE PROCESSING TES BY THE BIO-DISC PROCESS,
trol Corp., Milwaukee, Wis. Bio-Systems

Birks, and R. J. Hynek.
roceedings of the 26th Industrial Waste Con-
ce, Part 1, May 4-6, 1971, Purdue University, yette, Indiana. Engineering Extension Series 40, p 89-105, 11 fig, 4 tab, 2 ref.

riptors: *Industrial wastes, *Waste water ment, *Dairy industry, Facilities, Biological ment, Wisconsin, Septic tanks, Biochemical en demand, Flow control, Sewage lagoons, wastes, Sludge, Design, Operating costs.
ifiers: *Cheese processing wastes, *Bio-Disc ss, De Pere(Wis).

The Eiler Cheese Company, De Pere, Wisconsin, installed a Bio-Disc unit to treat their processing wastes. The treatment consists of a septic and flow equilization unit; a four-stage Bio-Disc unit with integral clarifier, and a 157,000 gallon, 30-day polishing lagoon. A sequential flow arrangement of septic tanks was designed to receive raw waste, collect dense solids, provide intimate mixing of raw waste and recycled sludge, equalize flow, reduce impact of peak flows, and digest sludge. The Bio-Module was installed 12 ft below ground level and consisted of a feed chamber, four-stage Bio-Disc assembly, and clarifier. Sludge scraped from the clarifier was returned to the septic tanks. Effluent went into the polishing lagoon, then into a stream. This first Bio-Disc installation in the U.S. has an excellent capacity for biological treatment of dairy wastes. Despite poor biodegradation efficiencies of the anaerobic pre-treatment system, 95% overall organic reduction and effluent BOD levels less than 10 mg/l were obtained. It could compensate for an acid waste feed and continue to provide organic reduction. Under high hydraulic and organic loads, it sustained high performance levels and operated efficiently during severe climatic conditions. It maintenance and operating costs are low. (Buchanan-Davidson--Wisconsin)
W76-02438

LANDFILL STABILIZATION WITH LEACHATE RECYCLE,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5E.
W76-02440

INVESTIGATION RELATED TO PREVENTION AND CONTROL OF WATER POLLUTION IN THE U.S. TNT INDUSTRY,
Edgewood Arsenal Aberdeen Proving Ground, Md. Chemical Lab.
D. H. Rosenblatt.
In: 'Pollution: Engineering and Scientific Solutions,' E. S. Barrekett, editor. Proceedings of the First International Meeting of the Society of Engineering Science, June 12-17, 1972, Tel Aviv, Israel, p 272-277.

Descriptors: *Explosives, *Water pollution control, *Waste water treatment, *Activated carbon, Adsorption, Chemical wastes, Sulfur, Chemical engineering, Bituminous materials.
Identifiers: *TNT, Sodium sulfite, Nucleophiles, 'Red waters', 'Pink waters', Ammunition plants.

TNT (2,4,6-trinitrotoluene) is produced exclusively in United States government owned facilities. Water pollution from TNT occurs when solid or molten crude TNT is washed with sodium sulfite to remove TNT isomers. Disposal of the intensely colored high-solids spent wash solution ('red waters') is difficult. Also wastes from sources, such as bomb and shell washings, enter streams and rivers where sunlight at alkaline or neutral pH turns them 'pink'. Procedures for treating 'red' and 'pink' waters are reviewed. When nucleophile reactions were studied using 2,4,5-trinitrotoluene in aqueous acetonitrile, the best nucleophiles at pH 7 were dithiophosphate, thiophenolate, alkylxanthate, sulfite, and dithiocarbpiperidide. TNT isomers exhibited consistent decreases of reactivity with nucleophiles in the order, 2,4,5,-, 2,3,4-, and 2,3,6-trinitrotoluene. Convergent synthesis may be possible by nitrating products of nucleophilic displacement on 2,4,5-, 2,3,4-, or 2,3,6-TNT isomers to give 2,4,6-trinitro-3-substituted toluene. The ambient nature of nitrite ion in attacking 2,4-dinitrohalobenzenes was studied. Only activated carbons prepared from bituminous coal were useful in removing TNT from water. Tests showed that critical bed depth is directly proportional to flow rate, part of the sorptive capacity can be regenerated with warm toluene, but the sorptive capacity approached some constant level on repeated use. (Buchanan-Davidson-Wisconsin)
W76-02441

ABATEMENT OF NITROBODIES IN AQUEOUS EFFLUENTS FROM TNT PRODUCTION AND FINISHING PLANTS,
Army Natick Lab., Mass.
L. A. Spano, R. A. Chalk, J. T. Walsh, and C. DePietro.
In: 'Pollution: Engineering and Scientific Solutions,' E. S. Barrekette, editor. Proceedings of the First International Meeting of the Society of Engineering Science, June 12-17, 1972, Tel Aviv, Israel, p 288-297. 7 fig, 2 tab.

Descriptors: *Waste water treatment, *Explosives, *Nitrogen compounds, Neutralization, Adsorption, Polymers, Color, Resins, Activated carbon.
Identifiers: *TNT, Ammunition plants, 'Red water', 'Pink water', Amberlite XAD-2, Filtrasorb-400.

The final step in the TNT manufacturing process is the finishing plant where alpha-TNT is the principal pollutant. To overcome the red discoloration and lower nitrobody concentration discharged to levels below those which are toxic to living organisms, direct absorption of polymeric resins was investigated. Amberlite XAD-2, a resin adsorbent which is a copolymer of styrene and divinylbenzene, adsorbs nitrobodies which contain primarily alpha-TNT. It is especially effective with wash waters which have not been neutralized and have not acquired the pink-amber color resulting from structural changes of alpha-TNT in water. The adsorption effectiveness of Amberlite XAD-2 is comparable to that of Filtrasorb-400 (an activated carbon) for influent throughputs equivalent to approximately 600 adsorbent bed volumes. Chemical regeneration of Amberlite XAD-2 saturated with alpha-TNT is effectively accomplished with acetone, but regeneration of Filtrasorb-400 has not been successful. To effectively remove nitrobodies from wash waters from alpha-TNT finishing processes and load and pack operations, a column of Amberlite XAD-2 should be used to adsorb most of the nitrobodies and color producing constituents in the stream. The effluent should then be passed through a polishing activated carbon bed to remove any residual color. (Buchanan-Davidson-Wisconsin)
W76-02442

WASTE TREATMENT FACILITIES FOR JONES AND LAUGHLIN STEEL CORPORATION, HENNEPIN WORKS,
Jones and Laughlin Steel Corp., Hennepin, Ill. Combustion and Utilities.
L. B. Stoner.
In: Proceedings of the 26th Industrial Waste Conference, May 4-6, 1971, Purdue University, Lafayette, Indiana, Purdue University Engineering Bulletin, Engineering Extension Series No 140, Part 2, p 761-765.

Descriptors: *Waste water treatment, *Water treatment, *Steel, *Industrial wastes, *Industrial water, Recirculated water, Sludge treatment, Oil wastes, Facilities, Acidic water, Illinois, Injection wells, Sludge disposal, Waste disposal.
Identifiers: Hennepin Works(Ill), Pickle liquor.

The Jones and Laughlin Steel Plant at Hennepin, Illinois, was designed to produce cold rolled sheets and galvanized sheet products. A hydrochloric acid pickle line for removal of scale and rust from hot rolled steel bands, cold reducing mill, temper mill, galvanizing line, facilities for slitting, shearing, corrugating, and finishing steel, and auxiliary facilities were built. Water from the Illinois River is pumped and treated to meet these needs. Water from filter backwash, softener regeneration, boiler blowdown, rolling solutions, condensate, and other uses is collected for waste treatment. Special procedures for treating oils,rolling solutions, solids, and sludge are described. Treated water was good enough for reuse. Waste pickle liquor is treated separately and its residues are injected into deep wells. Solids were first dewatered in a

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thickener and lagoon but their ultimate disposal proved problematical. Drying beds and soil conditioning were unsuccessful; sludge solidification is presently being tried. Oil disposal by land fill, commercial incineration, road oiling, and scavenger pickup was unreliable; incineration is now being considered. Excellent results on a consistent basis have been produced at this plant but technological changes and proposed effluent standards pose the threat of obsolescence. (Buchanan-Davidson--Wisconson)
W76-02445

WASTEWATER REUSE AND IN-PLANT TREATMENT,
Ashland Oil and Refining Co., Ky.
R. Willenbrink.
Water-1973, American Institute of Chemical Engineers Symposium Series, Vol 70, No 136, p 671-674, 1973. 3 fig.

Descriptors: *Water reuse, *Waste water treatment, *Oil industry, Kentucky, Water conservation, Phenols, Hydrogen sulfide, Ammonia, Condensers, Organic wastes, Oil wastes, Effluents, Pre-treatment(Water).
Identifiers: *Refineries.

Spent phenolic and sulfide caustic streams; foul water containing hydrogen sulfide, phenol, and ammonia; and vacuum tower jet condenser condensate constitute the bulk of soluble organic waste material generated in refineries and are of particular concern to the Ashland Oil Company, Ashland, Kentucky. Generation of phenol, ammonia, hydrogen sulfide, oil, and other similar contaminants is described and present methods of removing or treating them are discussed. The foul water reuse system, spent caustic disposal system, vacuum tower jet condenser condensate system, waste oil handling system, and in-plant phenol treatment system are described. The method used to handle waste oil at the Ashland's Catlettsburg Refinery is decribed. Pilot tests on foul water stripper effluent and desalter water draw have been discouraging. Before refineries modify or add to their waste water treatment system, they should determine what can be done to reduce waste water flow and contaminant concentrations. Improvement made in the process areas of existing plants will help meet stream standards and minimize final waste treatment costs. (Buchanan-Davidson--Wisconsin)
W76-02448

INDUSTRIAL WASTEWATER RECLAMATION,
Resources Conservation Co., Renton, Wash.
T. M. Fosberg.
Water-1973, American Institute of Chemical Engineers Symposium Series, Vol 70, No 136, p 534-538, 1973. 3 fig, 1 tab.

Descriptors: *Reclamation, *Industrial water, *Waste water treatment, *Water reuse, Design, Texas, Vapor compression distillation, Cooling towers, Evaporators, Ponds, Brines, Solar distillation.
Identifiers: *Cooling tower blowdown, El Paso Natural Gas Co.(Texas), Resources Conservation Co.(Wash).

The Resources Conservation Company of Renton, Washington uses the vapor compression evaporation principle to treat industrial waste water. Basic components of the system are heat transfer surfaces, an evaporator body, and a brine recirculation pump. The waste water reclamation plant installed at the El Paso Natural Gas Company, Texas, has a two-stage evaporator. The first stage concentrates cooling tower blowdown 14 times, yielding 29.5 gpm product water and a waste of approximately 2.5 gpm, which is fed to the second stage. The second stage concentrates the waste an additional 8 times for a total concentration of about 110 times. The high quality product water, which contains less than 10 mg/l total dissolved solids, is returned to the cooling towers. Waste brine flows into a solar evaporation pond, where the remaining water is evaporated. Cooling tower blowndown (evaporator feed) contains silica, calcium sulfate, and bicarbonate. Bicarbonate is removed by adding sulfuric acid. Scale formation is prevented by maintaining a seed slurry in each evaporator. The system is powered by electricity using 90 KWH/1000 gallons of product water. Low operating costs of the evaporator plus recovery and conservation of water minimizes water pollution control costs. (Buchanan-Davidson--Wisconsin)
W76-02450

MICROBIAL ENHANCEMENT OF PHOSPHORUS REMOVAL IN SLUDGE SEWAGE SYSTEMS,
Arizona Univ. Tucson. Dept. of Microbiology and Medical Technology.
C. F. Russ.
Ph.D. Dissertation, 1975, 56 p, 8 fig, 2 tab, 34 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Sewage bacteria, *Sludge treatment, *Phosphorus, Activated sludge, Microbial degredation, Sanitary engineering, Sewage, Water quality, Nutrient removal, Sludge, *Arizona, Water temperature, Hydrogen ion concentration, Biological properties, Water pollution, Ammonia, Nitrogen, Bacteria.
Identifiers: *Acinetobacter phosphadevorus, Tucson Sewage Treatment Platn(Arizona).

A developed sludge produced from filtered primary effluent from the sewage treatment plant in Tucson, Arizona and an organism (Acinetobacter phosphadevorus) isolated from sludge obtained from the Rilling Road Sewage Treatment Plant, San Antonio, Texas, has the capability to remove 80 percent of the phosphorus normally present in Tucson sewage in 8 hours, (most activated sludge-sewage treatment plants have a capacity to remove only 2 to 3 precent of the phosphorus). The optimum temperature range for growth of A. phosphadevorus and phosphorus uptake was from 27C to 37C in sewage broth and 27C in acetate broth. Optimum pH was 7.5 to 8.0 in sewage broth an 7.5 in acetate broth. The organism was shown to derive its nutrient from the volatile acid fraction of sewage and could use ammonium ions as a sole source of nitrogen. Phosphorus removal and growth, both in developed sludge and A. phosphadevorus cells, was inhibited by sodium azide, 2, 4-dinitropheno, sodium iodoacetate, and p-chloromecuribenzoic acid (compounds which affect oxidative phosphorylation, substrate level phosphorylation, sulfhydryl enzymes and membrane premeability). (Robinett-Arizona)
W76-02452

ST. ANNE'S (BOARD MILL LTD., ENGLAND) CLEANS UP THE RIVER AVON.
Pulp and Paper International, Vol 17, No 9, p 44-45, August 1975, 1 fig, 1 illus.

Descriptors: *Waste water treatment, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Flocculation, Aerated lagoons, Filtration, Sludge treatment, Suspended solids, Water reuse, Recycling, Water conservation, Polyelectrolytes, Water pollution control, *Treatment facilities.
Identifiers: Alum, Dorr-Oliver Clariflocculators, Dorr-Oliver sludge thickener, England.

The effluent treatment plant at the company's Bristol mill is described. It consists of two Dorr-Oliver Clariflocculators, a Dorr-Oliver sludge thickener, aeration lagoon, and sludge filter. The raw effluent containing an average of 600 ppm of suspended solids (with peaks up to 1000 ppm) is treated with alum and lime before entering a flash mixer. Polyelectrolyte is added immediately after the mixer to induce flocculation and the effluent flows to the Clariflocculators. Clarified effluent from the Clariflocculators flows to the lagoon million liter capacity), from the lagoon clarified effluent is discharged to the river v cascade spillway. Provision is made for recyc some of the clarified effluent to the mill suspended solids content of the final effluen less than 30 ppm. (Witt-IPC)
W76-02462

OXYGEN TREATMENT VS. HIGH-E SULFITE PULPING WASTE WATER.
Air Products and Chemicals, Inc., Allentown, P
T. G. Zitrides.
Pulp and Paper, Vol 49, No 10, p 126-128, S tember, 1975, 2 fig, 1 tab.

Descriptors: *Pulp wastes, *Sulfite liqu *Waste water treatment, *Oxygenation, Was Industrial wastes, Water pollution sources, W treatment, Suspended solids, Bleaching was Activated sludge, Biological treatment, Water rification, Biochemical oxygen demand, Oxy demand, Water pollution treatment, Water po tion control, Pilot plants, Washington, Effluc Washington.
Identifiers: Sulfite pulp mills.

Current waste water handling practices at the Angeles (Washington) Division of ITT Rayon an ammonia-base sulfite mill producing a rang fully bleached pulp grades, are described. sewer collects waste waters having relatively suspended-solids content, mainly from the w processing and pulping areas; the other coll mill effluents of relatively low suspended-so content, mainly wastes from the bleac sequence. The high-solids sewer discharge treated in a primary clarifier and mixed with low-solids discharge. An oxygen-activated slu effluent system (OASES) for secondary treatm has been evaluated. The trailer-mounted OA pilot-plant reactor has a nominal mixed-liq capacity of 650 gal and consists of five gastigh terconnected 130 gal vessels equipped with face aerators. A clarifier is mounted outside trailer. From data collected over a 3.5 mo period, it was learned that the average 5-day B removal rate was 90%. Overall oxygen consu tion averaged 1.3 lb/lb of BOD removed. (Sy IPC)
W76-02463

EFFECT OF AMMONIUM LIGNOSULFON ON SOIL MICROORGANISMS (O VLIYA LIGNOSUL'FONATA AMMONIYA POCHVENNYE MIKROORGANIZMY),
Akademiya Nauk SSSR, Moscow. Institut Ag himii i Pochvovedeniya.
For primary bibliographic entry see Field 5C.
W76-02464

WATER RECYCLING SYSTEMS AT MI PROCESSING WASTE PAPER (SISTE OBOROTNOGO VODOPOTREBLENIYA PREDPRIYATIYAKH, PERERABATYVAYUSHCHIKH MAKULA RU),
Ukrainskii Nauchno-Issledovatelskii Institut magi, Kiev (USSR).
For primary bibliographic entry see Field 3E.
W76-02465

DESIGN CRITERIA FOR HIGH-PURITY YGEN TREATMENT OF KRAFT MILL FLUENT,
CH2M/Hill, Corvallis, Oreg. Industrial Proce Div.
R. R. Peterson.
Journal Water Pollution Control Federation, 47, No 9, p 2317-2329, September, 1975. 9 f ref, 3 tab.

Descriptors: *Pulp wastes, *Waste water t ment, *Activated sludge, *Oxygen, *De

ia, Wastes, Industrial wastes, Waste treat-
Water pollution sources, Water pollution
ol, Aerated lagoons, Water purification,
e, Temperature, Hydrogen ion concentra-
Instrumentation, Pilot plants, Laboratory
Biochemical oxygen demand, Suspended
, Toxicity, Phenols, Treatment facilities, Ef-
s, Fish, Sludge treatment, Sticklebacks.
ifiers: Spills, Foaming, Kraft mills, Grease,
l mills.

n criteria for oxygen-aided activated sludge
nent of effluent (16 million gal/day)
arged from Fibreboard Corporation's San
in, California, kraft pulp and paper mill were
oped from pilot and laboratory studies.
vals of BOD, suspended solids, toxicity,
lics, and grease were evaluated. The
dures used to establish full-scale unit process
criteria for each treatment unit are
ibed in detail and illustrated by examples.
riteria for aeration basin sizing and oxygen
fer, secondary clarification and thickening,
udge production and handling are presented,
ner with design considerations for effluent
erature control, spill control and shock limita-
foam control, special pH considerations,
overall system instrumentation. The pilot
results demonstrated that activated sludge
nent of kraft effluents aided by high-purity
n provides a compact and efficient system
is not only stable under wide variations in
loading but can also remove all discharged
onents that are toxic to stickleback test fish.
ludges exhibit excellent settling properties,
ared to those activated with air in lieu of ox-
(Witt-IPC)
02466

**MI-MECHANICAL PAPER MILL AND MU-
PAL WASTE WATER TREATMENT PILOT
T STUDY,**
ingson, Durham, and Richardson, Omaha,

Krebs, and L. E. Shriver.
roceedings of the 28th Industrial Waste Con-
ce, Purdue University, May 1-3, 1973, p 861-
fig, 1 tab.

iptors: *Waste water treatment, *Municipal
s, *Pulp wastes, *Biological treatment,
ment facilities, Minnesota, Wastes, Industri-
stes, Water pollution sources, Water pollu-
treatment, Chemical wastes, Aeration,
ed lagoons, *Pilot plants, Waste treatment,
purification, Water quality control, Sludge
nent, Centrifugation.
fiers: Coated papers.

gical treatment of combined effluent from
llage of Grand Rapids, Minnesota, and the
in Paper Company, which produces high-
coated paper, is described. Modification of
xisting plant flow patterns to accomodate
on of pilot studies of the paper mill wastes,
ll as laboratory and full-scale studies on the
ency of various chemicals to reduce the pol-
characteristics of the wastes are outlined.
vaste treatment process includes extended
on with sludge recirculation, followed by
dary aeration ponds, followed by quiescent
g ponds. Solids are routed to aerated hold-
gestion ponds and then to centrifuges for de-
ing and final land disposal. Aeration is by
bubble diffusion or submerged aerating-mix-
bes. Descriptions of the pulping and paper-
g processes are included. (Sykes-IPC)
02467

**RENT STATUS OF PAPER
OCESSING EFFLUENT CHARAC-
STICS AND DISPOSAL PRACTICES,**
nal Council of the Paper Industry for Air and
n Improvement, Inc., Medford, Mass.
Gove, and J. J. McKeown.

TAPPI Secondary Fibers (and) Testing Conference, Madison, Wisconsin, Sept 16-18, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 17-29, 8 fig, 2 ref, 9 tab.

Descriptors: *Waste water treatment, *Pulp wastes, Pulp and paper industry, Effluents, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Biological treatment, Biochemical oxygen demand, Suspended solids, Activated sludge, Aerated lagoons, Water pollution control, Water pollution, Regulation.
Identifiers: *Waste paper, Deinking, Deinking mills, Best practicable treatment.

Effluent characteristics of mills utilizing secondary fiber (waste paper) depend on the type of furnish used as raw material for pulp manufacture, deinking processes employed, water reuse within the process, and properties of the end-product, and thus are highly variable. Because of the high organic strength of raw waste materials from deinking mills, biological treatment is generally required to attain acceptable BOD and total suspended solids levels. Activated sludge and aerated stabilization basin processes are currently being employed to treat mill effluents, but results obtainable with available control technology do not demonstrate the levels of proposed national effluent limitations. (Sykes-IPC)
W76-02468

SELECTING A MILL EFFLUENT TREATMENT SYSTEM--SOME CONSIDERATIONS,
D. R. Johnson.
In: TAPPI Engineering Conference, Toronto, Canada, Sept. 28-Oct. 2, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 61-68, 4 fig, 3 tab.

Descriptors: *Pulp wastes, *Aerated lagoons, *Activated sludge, *Waste water treatment, Operation and maintenance, Waste treatment, Water pollution treatment, Biological treatment, Pulp and paper industry, Biochemical oxygen demand, Suspended solids, Water pollution control, Treatment facilities, Seasonal, Climates.

The basic operating characteristics of activated sludge systems and aerated lagoons are identified, and the advantages and disadvantages of each system for treating pulp and paper mill effluents are outlined and discussed. Both systems produce treated effluents of comparable quality with respect to BOD and suspended solids. However, the aerated lagoon is simpler to operate and is not as prone to erratic behavior as the activated sludge system. Aerated lagoons find their best application in areas characterized by mild winters and hot summers. Activated sludge system operation is unrelated to climatic conditions. (Witt-IPC)
W76-02470

OPERATING EXPERIENCE WITH AN ADVANCED COLOR REMOVAL SYSTEM,
Gulf States Paper Corp., Tuscaloosa, Ala.
R. R. Fuller, H. H. Williams, and G. Hodge.
In: TAPPI Engineering Conference, Toronto, Canada, Sept 28-Oct 2, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 185-195, 4 fig, 2 ref, 9 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Color, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Suspended solids, Water purification, Activated sludge, Biochemical oxygen demand, Incineration, Sludge disposal, Ultimate disposal, Costs, Capital costs, Operating costs, Treatment facilities, Pulp and paper industry, Sludge, Alabama, Aluminum, Sulfates.
Identifiers: Beloit Passavant filter press, Nichols-Herrishoff furnace, Kraft mills.

A detailed description is given of the effluent treatment system at Gulf States Paper Corporation's Tuscaloosa, Alabama, kraft mill. The effluent is first clarified in a primary clarifier to settle suspended solids, treated in an oxygenaided activated sludge system to remove BOD, decolored by reacting with alum-mud, and finally clarified to remove the organic precipitate. The sludges from the primary clarifier, activated sludge reactor, and tertiary clarifier are combined and dewatered on a Beloit Passavant filter press, and the resulting high-solids sludge is incinerated without auxiliary fuel in a Nichols-Herrishoff furnace. The ash from the furnace is treated with sulfuric acid to recover alum-mud for reuse. Engineering aspects and capital costs of the plant, problems encountered, performance to date, and operating costs are discussed. (Witt-IPC)
W76-02471

AERATION-STABILIZATION WASTE TREATMENT: A CASE HISTORY,
Hoerner Waldorf Corp., Roanoke Rapids, N.C.
E. R. Hinson, and F. I. Fansler, Jr.
In: TAPPI Engineering Conference, Toronto, Canada, Sept. 28-Oct. 2, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 53-60, 5 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Aeration, Oxidation lagoons, Water purification, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Water pollution control, Operation and maintenance, Construction, North Carolina, Southeast U.S., Pulp and paper industry, Biochemical oxygen demand, Suspended solids, Sludge treatment, Sewage treatment.
Identifiers: Kraft mills.

Details are given of the development, construction, operation, and performance of the waste water treatment plant at Hoerner Waldorf Corporation's unbleached kraft mill at Roanoke Rapids, North Carolina. The system was put into operation in May of 1974. It features primary clarification and sludge ponding, and secondary treatment in an aerated lagoon and natural stabilization basins. In-plant changes were made to reduce water consumption and raw waste loads. Performance of the system to date has been good. BOD and total suspended solids reductions have exceeded the design criteria of 85% for BOD and 80% for suspended solids. Some of the operating problems encountered are discussed. (Witt-IPC)
W76-02472

PERFORMANCE HISTORIES OF BOILER FEEDWATER PLANTS HIGHLIGHT THE ADVANTAGES OF REVERSE OSMOSIS,
Ecodyne Corp., Union, N. J.
D. J. Butterworth, and W. C. Bass.
In: TAPPI Engineering Conference, Toronto, Canada, Sept 28-Oct 2, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 191-195, 7 fig, 2 tab.

Descriptors: *Boiler feed water, *Reverse osmosis, *Water treatment, Membrane processes, Costs, Capital costs, Operating costs, Industrial water, Water quality, Pre-treatment(Water), Water quality control, Quality control, Separation techniques.

Industrial plants utilizing boilers for generating process steam and electrical power consume large volumes of high-purity feedwater. Ion-exchange costs for boiler feedwater have risen sharply due to increased construction costs, scarcity and price of chemicals, and environmental discharge problems. Production and technical advances in reverse osmosis have countered inflationary trends, making the process competitive for many boiler feedwater requirements. Operating data for plants using reverse osmosis (in comparison to conventional ion-exchange) show large cost savings, particularly in chemicals consumed, and reduced waste discharge. Performance histories

highlight key areas for justifying the application of reverse osmosis in new or existing industrial plants based upon benefits in operating costs, installed costs, reliability, and waste discharge. (Witt-IPC)
W76-02473

WATER REUSE AT PONDEROSA PAPER PRODUCTS, INC., FLAGSTAFF, ARIZONA,
Ponderosa Paper Products, Inc., Flagstaff, Ariz.
D. Gibson, L. D. Lash, and E. G. Kominek.
In: TAPPI Engineering Conference, Toronto, Canada, Sept 28-Oct 2, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 69-75, 7 fig, 1 tab.

Descriptors: *Water reuse, *Pulp and paper industry, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Treatment facilities, Arizona, Flotation, Aerated lagoons, Settling basins, Sewage treatment, Suspended solids, Filtration, Water consumption(Except consumptive use), Water pollution control, Recycling, Pollution abatement, Equipment, Water conservation, Freshwater.
Identifiers: Paper towels, Toilet tissue, Secondary fiber mills, Waste paper, Tissue papers, Tissue mills, Towel paper.

Ponderosa Paper Products, Inc., is a 40 ton/day mill producing paper toweling and toilet tissue from recycled paper (ledger and manila paper and newsprint wastes). The waste water treatment system which produces water for plant reuse is described. Plant waste water is collected at a central point and treated in a dissolved-air flotation unit to remove settleable and floating solids. The clarified water is then aerated in a 3-section 2.2-million-gallon lagoon. Mechanical surface aerators provide oxygen to the first two sections as required; mixed liquor then flows into the quiescent zone for settling. From the lagoon storage basin, the effluent is polished in two automatic granular-media filters to remove additional suspended solids. The filtered effluent is pumped to a water tower for reuse in the mill. Some operating problems and plans for improving the waste treatment system are discussed. Fresh water consumption at the mill has been reduced from 500,000 to 30,000 gallons/day. (Witt-IPC)
W76-02474

A MILL, A RIVER, AND B(EST) P(RACTICABLE) T(REATMENT),
Thilmany Pulp and Paper Co., Kaukauna, Wis.
A. H. Martin.
In: TAPPI Engineering Conference, Toronto, Canada, Sept 28-Oct 2, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 179-184, 1 fig, 2 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Wisconsin, Water purification, Aerated lagoons, Activated sludge, Biological treatment, Water pollution treatment, Water pollution control, Hydrogen ion concentration, Costs, Capital costs, Operating costs, Energy, Oxygen, Legislation, Regulation.
Identifiers: Kraft mills, Best practicable treatment.

The steps taken by Thilmany Pulp and Paper Co.'s integrated kraft pulp and paper mill (Kaukauna, Wisconsin) in arriving at the waste water control technology to be used to meet the best practicable treatment requirements are described. Effluent treatment at the mill before best practicable treatment, evaluation studies of treatment systems potentially capable of complying with best practicable treatment requirement, and events leading to best practicable treatment selection are discussed. The best practicable treatment selected consists of primary clarification of paper mill effluents, treatment of pulp mill effluents in an aerated lagoon, treatment of the combined clarifier and lagoon effluents in an oxygen-aided activated sludge system, secondary clarification with sludge recycle to the activated sludge reactor, treatment of secondary clarifier effluent in a detention lagoon, and pH control of the final effluent. The impact of environmental costs (capital, operating, and energy) on the profit to assets ratio is also discussed. (Witt-IPC)
W76-02475

NEW METHOD FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS CONTAINING SULFIDES, POLYSULFIDES, METHYL MERCAPTAN, DIMETHYL SULFIDE, AND DIMETHYL DISULFIDE, BY CATALYTIC DEGRADATION WITH REDUCING IRON,
K. Popov.
Trudove na Nauchnoizsledovatelskiya Institut po Vodosnabdyavane Kanalizatsiya i Sanitarna Tekhnika, Vol 8, No 2, p 113-134, 1973. 1 fig, 2 tab.

Descriptors: *Sulfur compounds, *Waste water treatment, *Catalysts, *Chemical degradation, Sulfides, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Catalysts, Iron, Hydrogen, Chemical reactions, Effluents, Laboratory tests, Temperature, Time, Oxidation.
Identifiers: Polysulfides, Methyl mercaptan, Dimethyl sulfide, Dimethyl disulfide, Turpentine.

The proposed method for the purification of effluents containing sulfur compounds is based on the degradation of the latter by the catalytic action of reducing iron. This catalyst is obtained from rusted iron waste by reduction at high temperature with hydrogen or a gas containing hydrogen, e.g., coke gas. Finely dispersed iron has the capacity to dissolve hydrogen at high temperature with the formation of active iron hydrides. Laboratory experiments with this catalyst were conducted on waste waters from the turpentine and evaporation plants of the Kiradzhiev mill in Novi Krichim. The reaction was conducted in tightly closed vessels and with mixing. Important factors affecting the course of the reaction are the temperature, the amount of catalyst, and the time of contact. A 100% oxidation of sulfur compounds was obtained at 10 g catalyst/cu m, at room temperature, and a contact time of 1 hr. The catalyst could be reused four times without significant loss of activity. Its regeneration involves exposure to air and reduction of the iron oxides formed with hydrogen. An industrial process and equipment, which is described, has been developed on the basis of results obtained. The mechanism of the reactions taking place on the reducing iron catalyst are not well understood, but are presumed to be similar to those taking place on a Raney catalyst. The probable mechanisms of the reactions of the catalyst with the sulfur compounds and with the residual turpentine components emulsified in the effluent are discussed. (Stapinski-IPC)
W76-02476

STABILITY OF LIGNINS IN SULFITE MILL WASTEWATERS TO BIOCHEMICAL OXIDATION (ZUR STABILITAET VON SULFITZELLSTOFF- ABWASSERLIGNINEN GEGENUEBER BIOCHEMISCHER OXYDATION),
G. Otto, and H. Schmidt.
Zellstoff und Papier, Vol 24, No 7, p 198-201, July, 1975, 3 fig, 6 ref, 2 tab.

Descriptors: *Sulfite liquors, *Lignins, *Oxidation, *Pulp wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Stability, Color, Chemical oxygen demand, Biological treatment, Aeration, Waste treatment, Waste water treatment, Algae, Biodegradation.
Identifiers: Sulfite pulp mills, Spent sulfite liquors.

Biologically purified sulfite mill effluents were postaerated, 100 days for spruce spend sulfite liquor, 200 days for beech spent sulfite liquor. The decreases in characteristics such as color and COD were from 13 to 19%. Since part of thi
rification effect is due to removal of non-l
materials, it is concluded that the color-prod
lignins and substances related to lignin have a
stability to oxidation, at least under condi
where abundant growth of green algae can be
out. (Ward-IPC)
W76-02478

PURIFICATION OF EFFLUENTS FROM MANUFACTURE OF SEMICHEMICAL P (V'RKHU PRECHISTVANETO NA PADCHNITE VODI OT PROIZVODSTVOT POLUTSELULOZA),
S. Bogoev.
Trudove na Nauchno-Izsledovatelskiya Instit
Vodosnabdyavane Kanalizatsiya i Sanitarna T
nika, Vol 9, No 2, p 151-157, 1973, 2 ref, 2 tab
glish summary.

Descriptors: *Sulfite liquors, *Waste water t
ment, *Pulp wastes, *Aeration, Wastes, Indu
wastes, Water pollution sources, Water poll
treatment, Suspended solids, Biochemical ox
demand, Chemical oxygen demand, Hydroge
concentration, Phosphorus, Nitrogen, Muni
wastes, Ammonium salts, Sulfates, Biolo
treatment, Filtration, Organic compounds,
nins, Nutrients, Aerated lagoons, Color,
fluents, Organic loading, Oxidation.
Identifiers: Neutral sulfite semichemical pul
NSSC pulp mills, Bulgaria, Semichemical
mills.

At the Kiradzhiev paper mill in Bulg
semichemical pulp is produced from oak-
beechwood by the neutral sulfite process. Th
fluents from the digester room have a pH of
an average suspended solids content of 690
m, an average 5-day BOD of 545 g/cu m, an
average COD of 1300 g/cu m. The correspo
figures for the effluents from the pulp-d
machine are 6-7.5, 970, 1145, and 2160. Ex
ments were conducted with the overall effl
from the mill to determine the possibility of
purification in aeration tanks. Following the n
sary dilution, the needed phosphorus and nitr
were added either in the form of municipal se
or by the addition of superphosphate and amm
um sulfate according to a 5-day BOD:N:P ra
100:5:1. Prior to biological treatment
suspended solids were partially removed by f
tion to a residual content of 100 g/cu m. Acco
to data obtained for an aeration tank of 12
capacity, the reduction of BOD is about 85%
load of 1000 mg BOD/cu m/day. The purifie
fluents retain their initial dark brown color
have a COD of 200 g/cu m, on the average. Th
dicates a high content of unoxidized organic
pounds, probably mostly lignin. It is suggested
effluents from mills located in cities (e.g., the
mill in Sofia) be purified jointly with muni
sewage. In other mills, they can be pur
separately after the addition of neces
nutrients. (Stapinski-IPC)
W76-02479

5E. Ultimate Disposal Of Waste

**TRENCH INCORPORATION OF SEW
SLUDGE IN MARGINAL AGRICULTU
LAND,**
Agricultural Research Service, Beltsville,
Biological Waste Management Lab.
For primary bibliographic entry see Field 5D.
W76-02072

**AIR AND WATER QUALITY STANDARDS
FLORIDA,**
Florida State Dept. of Environmental Regula
Tallahassee.
For primary bibliographic entry see Field 5G.
W76-02096

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OSAL OF DREDGED MATERIAL IN GABLE OR OCEAN WATERS.
s of Engineers, Washington, D.C.
al Register, Vol 39, No 141, p 26635-26641, 2, 1974, 7 p.

riptors: *Navigable waters, *Dredging, ulation, *Administrative decisions, *Waste sal, *Environmental effects, Conservation, d States, Legislation, Water quality, Adtrative agencies, Adoption of practices, ion making, Wetlands, Fish, Wildlife, Land-

ifiers: *Disposal of dredged material, Adtrative regulations, Historic sites, Ocean ing, Hearings.

Department of the Army, acting through the s of Engineers, publishes herein the final ations prescribing the policies for review of al projects involving the disposal of dredged ial in navigable waters or its transportation e purpose of dumping it in ocean waters. Beany dumping is permitted, the District Enr is to evaluate other possible methods of sal and other appropriate dumping locations, into consideration possible effects on (1) nds, (2) fish and wildlife, (3) coastal zones marine sanctuaries, and (4) historical sites. sion is also made for public hearings if sted by a person having a demonstrated in- which may be affected by the disposal of ed material. However, a lack of response to hearing will be interpreted to mean that there objection to the disposal of the material. sh-Florida)
02099

GN SEMINAR FOR LAND TREATMENT MUNICIPAL WASTEWATER EFFLUENTS. GN FACTORS, PART I,
alf and Eddy, Inc., Palo Alto, Calif.
rimary bibliographic entry see Field 5D.
02185

GN SEMINAR FOR LAND TREATMENT MUNICIPAL WASTEWATER EFFLUENTS. GN FACTORS, PART II,
M/Hill, Denver, Colo.
rimary bibliographic entry see Field 5D.
02186

ALTERNATIVE TO OCEAN DISPOSAL.
American City and County, Vol 90, No 9, p eptember 1975.

riptors: *Dewatering, *Incineration, *Waste disposal, *Sludge disposal, Environmental ts, Costs, Treatment facilities.
ifiers: Pyrolysis, Filter presses.

mmendations from the Phase 1 Technical Rehat led to the development of the New York- Jersey Metropolitan Area Sewage Sludge sal Management Program are reported. e a limited quantity of sludge may be disposed land application, the best alternative to land ean sludge disposal is dewatering by filter es followed by pyrolysis. The choice of best sal method was based on environmental imeconomic feasibility, and energy recovery. It suggested that ocean disposal, which is used sively in the New York-New Jersey area, d be phased out and that multiple hearth inators which could be converted to pyrolysis should be implemented. Due to potential air tion, finding sites for incineration might be ult. The total costs of facilities to handle 2000 of sludge by the year 200 has been estimated 0 to $500 million in current dollars. (Kramer-)
02188

MUNICIPAL WASTEWATER REUSE IN THE U.S.,
SCS Engineers, Long Beach, Calif.
For primary bibliographic entry see Field 5D.
W76-02189

ARTIFICIAL GROUNDWATER RECHARGE AND WASTEWATER RECLAMATION,
Suffolk County Dept. of Health, N.Y.
For primary bibliographic entry see Field 5D.
W76-02197

SEPTIC TANK TEE,
For primary bibliographic entry see Field 5D.
W76-02207

METHOD AND APPARATUS FOR PROCESSING REFUSE, SEWAGE AND/OR WASTE MATERIAL INTO A SOURCE OF ENERGY,
For primary bibliographic entry see Field 5D.
W76-02214

WASTE WATER COOLANT.
For primary bibliographic entry see Field 5D.
W76-02340

CHROMIC ACID SYSTEM RECLAIMS MATERIAL, SOLVES PLATING PLANT POLLUTION PROBLEMS.
For primary bibliographic entry see Field 5D.
W76-02351

HYGIENIC PROBLEMS OF THE PROTECTION OF SURFACE WATERS AND MODERN TECHNOLOGY IN INDUSTRY, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W76-02354

RECOVERY PLANT RECYCLES OIL WASTE.
For primary bibliographic entry see Field 5D.
W76-02358

FILTRATION KEY TO CONVERTING WASTE OIL INTO USABLE FUEL.
For primary bibliographic entry see Field 5D.
W76-02359

PACKING PICKLES WITH RECYCLED BRINE.
For primary bibliographic entry see Field 5D.
W76-02360

LANDFILL STABILIZATION WITH LEACHATE RECYCLE,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
F. G. Pohland, and P. R. Maye.
In: Third Annual Environmental Engineering and Science Conference, March 5-6, 1973, Louisville, Kentucky, p 389-412, 15 fig, 3 tab. EPA R-801397.

Descriptors: *Landfills, *Stabilization, *Leachate, *Recycling, Biodegradation, Return flow, Moisture, Waste water treatment, Organic acids, Hydrogen ion concentration.

Sanitary landfill stabilization is largely dependent on biological activity for decomposition of organic materials. To demonstrate the advantages of leachate collection and recycling in accelerating stabilization of sanitary landfills, simulated landfills were constructed and filled with compacted refuse, comparable to municipal domestic solid wastes. Studies for 600 days indicated that leachate recirculation established an active biological population more rapidly than in the control system, causing an increased stabilization rate and decreasing the time of biological stabilization of readily available organic matter. The column was an effective treatment system for its own leachate, reducing the concentration of pollutants discharged. Control BOD, COD, and TOC levels rose then declined slowly; in the recirculating unit, they rose, then decreased rapidly to much lower values, and, volatile acids rose initially, then were converted to methane and carbon dioxide. Leachate pH was low at first, but returned to neutral rapidly. Alkalinity was lowest when volatile acids were high, and vice versa. Less organic and ammonia nitrogen were available in recycled leachate. The test results provide a basis for more accurate estimation or prediction of effects on the environment, leachate control, and opportunities for the ultimate use of landfill sites. (Buchanan-Davidson--Wisconsin)
W76-02440

WASTE TREATMENT FACILITIES FOR JONES AND LAUGHLIN STEEL CORPORATION, HENNEPIN WORKS,
Jones and Laughlin Steel Corp., Hennepin, Ill.
Combustion and Utilities.
For primary bibliographic entry see Field 5D.
W76-02445

CURRENT STATUS OF PAPER REPROCESSING EFFLUENT CHARACTERISTICS AND DISPOSAL PRACTICES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Medford, Mass.
For primary bibliographic entry see Field 5D.
W76-02468

EVALUATION OF GROUND-WATER DEGRADATION RESULTING FROM WASTE DISPOSAL TO ALLUVIUM NEAR BARSTOW, CALIFORNIA,
Geological Survey, Garden Grove, Calif.
For primary bibliographic entry see Field 5B.
W76-02480

EVALUATION OF MONITORING OF RADIOACTIVE SOLID-WASTE BURIAL SITES AT LOS ALAMOS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-02488

SOLID-WASTE DISPOSAL SITES IN RELATION TO WATER RESOURCES IN THE SEATTLE-TACOMA URBAN COMPLEX AND VICINITY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-02489

5F. Water Treatment and Quality Alteration

SAFE DRINKING WATER ACT.
Public Law 93-523, 93rd Cong, December 16, 1974. 34 p.

Descriptors: *Potable water, *Supervisory control(Power), *Water quality control, *Water quality standards, *Public health, Administrative agencies, Administrative decisions, Decision making, Federal government, United States, Administration, Legal aspects, Governments, Jurisdictions, Water quality, State governments, Water pollution, Safety, Adoption of practices, Coordination, Regulation.
Identifiers: *Environmental Protection Agency, *Contaminant levels, Civil actions, Administrative regulations, Citizen suits, Enforcement, Health.

This Act amends the Public Health Service Act to assure that the public is provided with safe drinking water. The Act, with certain exceptions, applies to each public water system in each state, although primary enforcement responsibility remains with the states. The Act provides that the Administrator of the Environmental Protection Agency shall publish proposed national interim primary drinking water regulations covering recommended maximum contaminant levels as determined by the National Academy of Sciences. Timetables and guidelines are set out by which the Administrator is to determine state compliance. If he deems in necessary, the Administrator has emergency powers to protect the health of persons endangered by contaminants in any public water system. Other provisions include: (1) variances, hearings and penalties; (2) chemical supplies necessary for water treatment; (3) research and technical assistance; and (4) commencement of civil suits either by the Administrator or by private citizens for violations of drinking water standards under this title. (Parrish-Florida)
W76-02078

SAFE DRINKING WATER ACT PL93-523--(LEGISLATIVE HISTORY).
US Code Cong and Admin News, p 6454-6506, 1974, 53 p.

Descriptors: *Potable water, *Domestic water, *Water purification, *Standards, *Public health, Water quality, Legislation, Regulation, Law enforcement, Penalties(Legal), Water quality, Federal jurisdiction, State jurisdiction, Grants, Research and development, Taste, State governments, United States, Federal government, Adoption of practices, Underground streams, Water sources.
Identifiers: *Safe Drinking Water Act, Public water systems.

The purpose of this legislation is to assure that water supply systems serving the public meet minimum national standards for protection of public health. In contrast to existing legislation, this bill would authorize the Environmental Protection Agency (EPA) to establish federal water quality standards applicable to all public water systems. The bill would also establish a joint Federal-State system for assuring compliance with these standards and for protecting underground sources of drinking water. The EPA would be responsible for issuing primary regulations concerning maximum allowable contaminant levels. In addition, the EPA would issue regulations specifying the criteria and procedures necessary to assure compliance with drinking water standards. The bill would further provide for Federal grants to assist State surveillance and enforcement programs under this legislation. States which adopt and implement adequate standards and enforcement measures are authorized to grant variances from national regulations, and to grant exemptions extending the time for compliance by any public water system. In giving States the authority, the bill reflects a desire for more flexible and effective implementation at local levels. Supplementing the bill are comments received by the Committee on Interstate and Foreign Commerce from various governmental agencies concerning its passage. (Hoffman-Florida)
W76-02090

PUMPS AND VALVES FOR THE WATER INDUSTRY.
For primary bibliographic entry see Field 8C.
W76-02173

SEWAGE DISPOSAL PLANT WITH AUTOMATIC CONTROL SYSTEM.
For primary bibliographic entry see Field 5D.
W76-02196

METHOD AND APPARATUS FOR THE DISINFECTION OF LIQUIDS BY ANODIC OXIDATION AND PRECEDING REDUCTION,
Sachs-Systemtechnik G M. b. H., Schweinfurt (West Germany), (assignee).
V. Eibl, and A. Reis.
U.S. Patent No 3,910,829, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 939, No 1, p 337, October 7, 1975.

Descriptors: *Water treatment, *Patents, *Disinfection, *Water purification, *Water quality control, *Water pollution treatment, *Oxydation, Electrodes, Anodes, Cathodes, Electric currents, Waste water treatment.
Identifiers: Detoxication.

A method of purifying an aqueous liquid contaminated with microorganisms is disclosed. The method consists in exposing the liquid to be disinfected to a reducing agent before the treatment in the electrolytic cell, i.e., enriching the liquid with electrons. If the cathode compartment of an electrolytic cell is used as the reduction agent it is not necessary to add any reagents to the liquid so as to obtain a reduction effect. It is of some advantage to make such an arrangement so that a number of electrolytic cells are passed subsequently, whereby the liquid flows through the cathode compartment of the first cell and through the anode compartments of the following cells. The cells are arranged in series such that the outlet from the cathode compartment of one cell is connected to the inlet of the anode compartment of another cell and so on. (Sinha-OEIS)
W76-02251

TWIN BELT ION EXCHANGE SYSTEM,
E. L. Karlson.
U.S. Patent No 3,910,842, 5 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 939, No 1, p 341, October 7, 1975.

Descriptors: Patents, *Ion exchange, *Water treatment, *Separation techniques, *Demineralization, *Water purification, *Water quality control, Anion exchange, Cation exchange, Resins.

The primary object of this invention is provde a system for deioninzing a solution by the belt method while employing a single treatment tank. A pair of endless belts are employed, one belt has incorporated into its construction an anion exchange resin and the other belt has so incorporated a cation exchange resin. Both belts are passed through the flowing solute in a direction opposite to its flow while simultaneously making a number of traversals perpendicular to the fluid flow. All the fluid is caused to pass through each belt a number of times. The fluid is thereby substantially deionized. Upon leaving the flowing liquid, the anion belt is passed through an anion resin regeneration tank where it is stripped of its captured anions and regenerated prior to returning to the fluid under treatment. The cation belt similarly is removed from the fluid under treatment and passes to a cation resin regenerating tank where it is similarly stripped of captured cations and regenerated prior to return to the fluid. (Sinha-OEIS)
W76-02254

LOW COST CHLORINATION SYSTEM.
For primary bibliographic entry see Field 5D.
W76-02301

NEW WESTINGHOUSE PLANT PRODUCES COMPLETE LINE OF WATER AND WASTEWATER TREATMENT EQUIPMENT.
For primary bibliographic entry see Field 5D.
W76-02345

NEW ANTICORROSION COATING, 4P, F DRINKING WATER TANKS ON SHIPS, RUSSIAN),
For primary bibliographic entry see Field 5G.
W76-02357

FACTORS IN THE ELIMINATION OF THE MATURE STAGES OF ANOPHE QUADRIMACULATUS SAY IN A WA LEVEL FLUCTUATION CYCLE,
Johns Hopkins Univ., Baltimore, Md. Schoo Hygiene and Public Health.
For primary bibliographic entry see Field 5G.
W76-02430

WATER MANAGEMENT PLANNING F MALARIA PREVENTION IN THE DAMOD VALLEY, INDIA,
Disease Center, Savannah, Ga. Communicable
For primary bibliographic entry see Field 5G.
W76-02432

NATURAL BIOLOGICAL CONTROL OF T SALT MARSH MOSQUITO IN THE ACID M DRAINAGE SWAMPS IN WESTERN K TUCKY,
Speed Scientific School, Louisville, Ky.
For primary bibliographic entry see Field 5G.
W76-02433

PRODUCTION AND CONTROL OF FLO WATER MOSQUITOES INCIDENTAL WATER LEVEL OPERATIONS ON RES VOIRS OF THE TENNESSEE VALL AUTHORITY,
Tennessee Valley Authority, Wilson Dam, A Div. of Health and Safety.
For primary bibliographic entry see Field 5G.
W76-02443

WATER LEVEL MANAGEMENT FOR T CONTROL OF ANOPHELES QUADRIMA LATUS IN THE TENNESSEE VALLEY,
Tennessee Valley Authority, Wilson Dam, A Malaria Control Branch.
For primary bibliographic entry see Field 5G.
W76-02447

5G. Water Quality Control

DEEPWATER PORT ACT OF 1974.
For primary bibliographic entry see Field 6E.
W76-02077

SAFE DRINKING WATER ACT.
For primary bibliographic entry see Field 5F.
W76-02078

RESOURCE SCARCITY, ECNOMIC GROW AND THE ENVIRONMENT.
For primary bibliographic entry see Field 6E.
W76-02079

GREAT LAKES WATER QUALITY 1974 A NUAL REPORT.
International Joint Commission-United States a Canada. Great Lakes Water Quality Board.
Available from International Joint Comm' n Gr Lakes Water Quality Board, 3 rd Annual R (1974). 170 p, 4 fig, 16 tab, 3 append.

Descriptors: *Water quality control, *Canad *Great Lakes, *Great Lakes Regi *International Joint Commission, Municip wastes, Eutrophication, Water pollution contr Land use, Programs, Governments, Pollut abatement, Control, Navigation, Facilities, Wa policy, Water law, United States, Internatio waters, Hazards.

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ifiers: *Hazardous substances.

972 the United States and Canada signed the t Lakes Water Quality Agreement, thereby eing to develop and implement programs ied necessary to restore and enhance water ty in the Great Lakes System. The Interna- l Joint Commission (IJC) was directed to t the Governments in implementing the ement. This report provides the basic infor- on required by the IJC to make its report to overnment on progress during 1974 in achiev- ie objective of the Agreement. Data and con- ons based on that data are presented on a ber of topics involving the Great Lakes re- including: (1) water quality assessment; (2) cipal pollution abatement; (3) eutrophication phosphorous control; (4) industrial pollution ement; (5) institutional activities; and (6) r quality objectives. Information is also ented on other subjects such as dredging, land activities, shipping, onshore and offshore ties, joint contingency plans and hazardous ting substances. An annex to the report ents the specific water quality objectives for oundary waters of the Great Lakes System. fman-Florida)
-02080

NOIS LAWS RELATING TO WATER- 'S, 1973.
ois State Dept. of Transportation, Springfield. of Waterways.
rimary bibliographic entry see Field 6E.
-02081

ERWAYS, DRAINAGE, FLOOD CON- L, WATER POLLUTION AND OURCES STUDY COMMISSION.
rimary bibliographic entry see Field 6E.
-02083

NTIES (PROVISIONS OF ILLINOIS TUTES RELATING TO COUNTY JU- DICTION OVER WATERS AND WATER- 'S).
rimary bibliographic entry see Field 6E.
-02089

E DRINKING WATER ACT PL93-523-- GISLATIVE HISTORY).
rimary bibliographic entry see Field 5F.
-02090

DEGRADATION OF WATER QUALITY: NEED FOR EFFECTIVE ACTION,
nyder.
e Dame Lawyer, Vol 50, p 890-909, 1975, 20 9 ref.

riptors: *Federal Water Pollution Control *Degradation, *Water quality control, mnistration, *Water pollution control, slation, Decision making, Administrative cies, Water quality standards, Regulations, line studies, Water policy, Programs, At- es, Water quality, Classification, Bodies of r, Control systems, Adoption of practices. tifiers: *Nondegradation, Guidelines.

ondegradation program is aimed at keeping water clean. Without an effective non- adation program, polluters may in- riminately pollute clean waters without regu- n until the water reaches minimum water ty standards. The Environmental Protection ncy (EPA) is criticized for not instituting a ive nondegradation policy as it is authorized under the Federal Water Pollution Control (FWPCA). For example, no water quality lards have ever been issued by the EPA to en- nondegradation policies. So far the only ished EPA pronouncements on nondegrada- tion have been its Water Quality Strategy Papers. While these papers have identified the key elements of a nondegradation policy, they are only intended as guidelines and thus have no legal force. Even if these guidelines had legal force, they would still be of little value since they provide no guidance for implementation. The National Resources Defense Counsel has proposed a nondegradation program detailing procedures for classifying waters according to the degree of permissible degradation. The enforcement of this program would center on a permit system whereby dischargers would have the burden of showing that their proposed discharge does not violate prescribed standards. (Hoffman-Florida)
W76-02092

MAKING ENVIRONMENTAL LEGISLATION WORK,
Minnesota Mining and Mfg. Co., St. Paul.
For primary bibliographic entry see Field 6E.
W76-02093

AIR AND WATER QUALITY STANDARDS IN FLORIDA,
Florida State Dept. of Environmental Regulation, Tallahassee.
P. Baljet.
Florida Environmental and Urban Issues, Vol 11, No 6, p 9-10, 17 Aug, 1975, 3 p, 2 illus.

Descriptors: *Water quality standards, *Florida, *Waste disposal, *Saline water, *Water pollution control, *Sewage disposal, Salinity, Water pollution sources, Wastes, Effluents, Sewage effluents, Shores, Environmental effects, Outfall sewers, Sewage bacteria, Beaches, Swimming, Eddies, Pathogenic bacteria, Public health.
Identifiers: *Miami Beach(Fla), Gulfstream.

Florida has the strictest environmental standards in the Southeast, but the current economic situation has applied increasing pressure for the relaxation of both air and water standards. In Dade County, for example, the city of Miami Beach discharges sewage into the ocean where circular eddy currents often bring sewage outfalls back onto bathing beaches. Arguments that the Gulfstream is so big that sewage discharge into it is not harmful fail to take stream fluctuations into account. It is only the sterilizing effect of saline water that has prevented greater health problems. However, secondary treatment of ocean outfalls is expensive because of the great quantities of sewage involved. Before costly changes in sewage treatment are undertaken, studies should be made to determine the effects of swimming in saline waters affected by sewage outfalls. (Parrish-Florida)
W76-02096

DISPOSAL OF DREDGED MATERIAL IN NAVIGABLE OR OCEAN WATERS.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 5E.
W76-02099

ALABAMA; NAVIGABEL WATERS (PROPOSED WATER QUALITY STANDARDS).
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 138, p 26168-26169, July 17, 1974, 2 p.

Descriptors: *Water quality standards, *Alabama, *Navigable waters, Federal Water Pollution Control Act, *Standards, *Water pollution control, Rivers, Streams, Fish, Wildlife, Water quality control, Governments, Federal government, State government, Administrative agencies, Administration, Water utilization.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Pursuant to the Federal Water Pollution Control Act Amendments, the Environmental Protection Agency (EPA) reviews water quality standards for interstate and intrastate waters adopted and submitted by the states. Alabama has submitted its standards for EPA review, and they have been found to be consistent with the law. Therefore, the Alabama submissions are now the effective water quality standards within the state under Section 303 of the Act. A proposed new section of Alabama's standards provides that certain specific waters classified 'Fish and Wildlife as a Goal' will be excepted from meeting water quality standards as required by Public Law 92-500. Other specified streams are to be reclassified as 'Fish and Wildlife.' (Parrish-Florida)
W76-02100

GUIDELINES FOR REVIEW OF FISH AND WILDLIFE ASPECTS OF PROPOSALS IN OR AFFECTING NAVIGABLE WATERS.
Fish and Wildlife Service, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-02102

PHOSPHATE MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No 18, Part 11, p 4102-4113, January 27, 1975, 12 p.

Descriptors: *Phosphates, *Industrial wastes, *Effluents, *Water pollution control, Water pollution sources, Chemical wastes, Liquid wastes, Water quality standards, Technology, Penalties(Legal), Economic impact, Regulation, Economic justification, Discharge(Water), Sewage effluents, Water law, Legal aspects, Standards.
Identifiers: Phosphate plants, Point sources of pollution, Effluent guidelines, Administrative regulations, Effluent limitations, Hazardous substances(Pollution).

These regulations set effluent limitations and guidelines for existing sources for the defluorinated phosphate rock subcategory and the sodium phosphates subcategory of point sources in the phosphate manufacturing category. In addition to the regulations, proposed standards of performance for new point sources and pretreatment standards for existing sources and new sources are presented. A summary of conclusions are presented on a variety of aspects including: categorization, waste characteristics, origin of waste water pollutants, treatment and control technology, cost estimates for control of waste water pollutants, and economic impact analysis. Effluent limitations guidelines are given for two categories, with one representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available, and the other representing the degree of effluent reduction attainable by the application of the best available, economically feasible technology. (Hoffman-Florida)
W76-02103

MORALES V. WESTERGARD (CALIFORNIA-NEVADA INTERSTATE COMPACT AND LAKE TAHOE CONDOMINIUMS).
For primary bibliographic entry see Field 6E.
W76-02113

CITY OF ROSWELL V. REYNOLDS (CITY'S CHANGING POINTS OF APPROPRIATION FROM UNDERGROUND WATER BASIN NOT AN IMPAIRMENT OF OTHER USERS' RIGHTS).
For primary bibliographic entry see Field 6E.
W76-02114

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JENNINGS V. WALSH (NO SEWER SERVICE CHARGE TO HOMEOWNERS WITH SEPTIC TANKS EVEN THOUGH SEPTIC TANK'S CONTENTS PLACED EVENTUALLY IN SEWER OF MUNICIPALITY).
For primary bibliographic entry see Field 6E.
W76-02116

POLLUTION CONTROL ACT (1973 AND 1974 AMENDMENTS).
For primary bibliographic entry see Field 6E.
W76-02128

THE AWAKENED INTEREST IN THE SEWER ORDINANCE,
Camp Dresser and McKee, Boston, Mass.
R. H. Culver, and T. Saxon.
In: Proceedings of the 29th Industrial Waste Conference, May 7, 8 and 9, 1974, Part One, Purdue University, Lafayette, Indiana, p 565-573, 2 ref, 2 append.

Descriptors: *Sewerage, *Legislation, *Local governments, *Waste water treatment, Sewers, Industrial wastes, Cost allocations.
Identifiers: *Sewer ordinances.

The promulgation of regulations banning the discharge of untreated wastes has augmented the need for new sewer ordinances in many communities. It is now necessary to limit the discharges to the sewer system to those wastes that can be adequately treated by municipal treatment systems and which are not toxic to the system. In addition, PL 92-500 requires that all applicants for federal assistance in the construction of sewer works have a system of allocation of charges for sewer use. When planning for a new ordinance, decisions must be made on the design capacity of the system, the wastes which will or will not be treated, the administrative and operating body for the works, and the method which will be used to pay for the system. The ordinance should promote the best utilization of the sewer works that will achieve protection of public health, protection of the works, safety for the operating personnel, and efficiency of the treatment process. An ordinance generally consists of five parts. The first section defines all the special terms used in the ordinance and eliminated differences of interpretation that may cause dispute and litigation. A section on the conditions for discharge to the system described who must discharge to the system, and the manner in which the connections are to be made. The last three sections include: the limitations on what may be discharged to the sewer; the powers of the authority to inspect, assign penalties, and prohibit discharges; and, a description of the cost assessments. (Orr-FIRL)
W76-02199

ECONOMIC ALTERNATIVES IN SOLVING THE U.S.-MEXICO COLORADO RIVER WATER SALINITY PROBLEM,
Arizona Agricultural Experiment Station, Tucson.
For primary bibliographic entry see Field 3A.
W76-02226

FRESH WATER FOR ARIZONA BY SALT REPLACEMENT DESALINATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3A.
W76-02231

DEVICE FOR RECOVERING POLLUTING PRODUCTS SPREAD OVER THE WATER SURFACE, IN PARTICULAR OIL PRODUCTS,
Institut Francais du Petrole, Rueil-Malmaison (France). (Assignee).
P. Degobert, F. Kermarrec, and Y. Nadaud.
U.S. Patent No 3,912,635, 4 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 939, No 2, p 934, October 14, 1975.

Descriptors: *Patents, Water pollution control, *Oil pollution, *Oil spills, *Water pollution treatment, *Water quality control, Oil-water interfaces, Porous media, Equipment, *Separation techniques, Pollution abatement.

This device is adapted to recover polluting products of a lower density than water and which are immiscible by creating at the water surface a recess for collecting these polluting products. The recess is defined by at least one wall of which at least a portion is porous. The wall portion is made of a hydrophobic material easily wetted by the polluting products and through which these products selectively penetrate into the recess and which forms a barrier against water. The containers maintain the same porous portion at the level of the slick of polluting products floating on the water surface until the container is completely filled up. It is necessary to give the porous portion of the wall the greatest possible height so that the container which sinks progressively into the water as it becomes more filled, can gather a sufficient quantity of polluting products. The containers can be equipped with adjustable ballasting means. (Sinha-OEIS)
W76-02265

A QUANTITATIVE METHOD FOR EFFLUENT COMPLIANCE MONITORING RESOURCE ALLOCATION,
Systems Control, Inc., Palo Alto, Calif.
A. I. Cohen, Y. Bar-Shalom, W. Winkler, and G. P. Grimsrud.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-600/5-75-015, September 1975. 244 p, 44 fig, 48 tab, 34 ref, 7 append. EPA 1HC619. 68-01-2232.

Descriptors: *Monitoring, Standards, Effluents, Water quality control, *Resource allocation, *Michigan, Statistical methods, *Water quality standards, Cost analysis, River basins.
Identifiers: *Effluent standards.

A quantitative method is developed and demonstrated for the preliminary design of effluent standard surveillance systems. A procedure is presented to be used in the state or EPA water quality programs to determine the frequency of effluent compliance monitoring visits. The procedure allocates compliance monitoring budgetary resources so as to minimize environmental damage. It utilizes a statistical model of the effluents that is obtained from self-monitoring and compliance monitoring data. The procedure is demonstrated on an example river basin using data supplied by the State of Michigan. (EPA)
W76-02269

WATER QUALITY CONTROL THROUGH SINGLE CROP AGRICULTURAL, NO 4,
Bemidji State Coll., Minn. Center for Environmental Studies.
K. R. Lundberg, and P. T. Trihey.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/2-75-026, June 1975. 116 p, 6 fig, 24 tab, 27 ref, 2 append. EPA 1BB045. 802168 (16080 FQV).

Descriptors: *Farm wastes, Nitrogen, Peak, Rice, Nutrients, Phosphorus, Water quality control, Surface waters, Crops response, Consumptive use, Bioassay, Minnesota, Agriculture.
Identifiers: Wild rice culture, Nutrient control, Peat soils, Clearwater River(Minn).

A study was conducted to determine effects on water quality from flooded paddies used for the commercial culture of wild rice, Zizania aquatica. Water samples were taken from flooded impoundments of fertilized peat and mineral soils as well as unfertilized peat soils. Weekly changes in the chemical and physical parameters of water entering, within, and discharged from paddies measured through the summer. No signif changes were observed in the receiving wate fall drawdown occurred when increases in solved solids, total Kjeldahl-nitrogen and phosphorus occurred in the Clearwater R Algal assay tests indicated that the increa nutrients at peak discharge was sufficient crease algal populations. The quantities nutrients released from rice paddies were sig nificantly greater than would be expected in mal runoff in the area and much less than amounts released from most agricultural deavors. Consumptive water use was 20-22 i per acre (51-56 cm/ha). (EPA)
W76-02272

EFFECTS OF MANAGEMENT PRACTICES WATER QUALITY AND QUANT COWEETA HYDROLOGIC LABORAT NORTH CAROLINA,
Forest Service (USDA), Coweeta Hydrologic Franklin, N.C.
J. E. Douglass, and W. T. Swank.
In: Municipal Watershed Management Sym um Proceedings, USDA Forest Service Ge Technical Report NE-13, 1975, p 1-13. 6 fig, 20 ref.

Descriptors: *Water yield improvement, *W quality, Chemical properties, *Water pollu *Thermal pollution, *Sediment concentra North Carolina.
Identifiers: Blue Ridge Mountains.

Results from nearly 40 years of watershed ex ments at Coweeta are summarized. An equati presented to predict the annual increase in str flow from the percent basal area cut and fro theoretical extra-terrestrial radiation load fo watershed. Timing of the increased flow watershed experiments depends on the magn of the increase, but results consistently show much of the increase appears in the low season. Two watershed experiments indicate conversion of hardwoods to white pine sub tially reduces monthly and annual stream Conversion of a hardwood-covered watersh grass produces up to 5.8 inches of increased per year. Although some increase in nutrien port occurs from forest cuttings and species versions, the increase is well within drinking-w standards. (Forest Service-USDA)
W76-02275

ACID MINE REHABILITATION PROBL AT HIGH ELEVATIONS,
Forest Service (USDA), Ogden, Utah. Interm tain Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W76-02281

NEW ANTICORROSION COATING, 4P, DRINKING WATER TANKS ON SHIPS, RUSSIAN),
I. I. Apollonova, and B. N. Kunitsyn.
Gig Sanit. 9 p 98-100, 1974.

Descriptors: *Corrosion control, Corros *Potable water, Ships, Water quality, Colifo Protective coating.
Identifiers: Ships, Tanks, Thermoplastic coati

The odor, taste, transparency, color, pH, oxic bility and coliform titer of water stored in t coated with a new nontoxic, explosion-proof t moplastic coating 4 P intended for coating drin water tanks of ships is discussed. The new coa can reliably protect water tanks from corro and has no unfavorable effect on drinking w quality.--Copyright 1975, Biological Abstra Inc.
W76-02357

HYDRONOMIC ANALYSIS OF FOREST NAGEMENT ALTERNATIVES FOR EN-ONMENTAL QUALITY: A CASE STUDY OF SCA COUNTY,
nesota Univ., St. Paul. Coll. of Forestry.
primary bibliographic entry see Field 6B.
-02362

O WILL PAY FOR POLLUTION CON-OL.--THE DISTRIBUTION BY INCOME OF BURDEN OF THE NATIONAL ENVIRON-NTAL PROTECTION PROGRAM, 1972-1980,
an (Robert R.) Associates, Inc., Washington,

. Dorfman, and A. Snow.
onal Tax Journal, Vol 28, No 1, p 101-115,
. 6 fig, 3 tab, 11 ref.

criptors: *Pollution abatement, *Costs, tribution, Cost allocation, Cost sharing, ncing, Governments, Industries, Regressive s, Social impact.
tifiers: *Antipollution legislation, *Public s, Family income, Automobile emissions.

costs of environmental protection programs have been legislated by Congress have to be at some point and so far no clear idea is availa-where the costs are falling. The program is not nced by the Federal tax system, instead the len falls on other groups in the economy. This y attempts to allocate the shares borne by n family income group and to estimate the ef-s of the costs of the pollution abatement pro-ns. The costs will be net by all levels of govern-t, private industry, and automobile users. The y estimates the share of the costs borne by dif-nt U.S. income groups for 1972, 1976, and). The cost data is not considered to be pletely accurate but provides enough indica-of the cost trends. In 1972 the burden was lly regressive and this is likely to be more so as decade progresses. By 1980 the costs of the en-nmental protection program is likely to be e regressive than a general sales tax. penter-Wisconsin)
5-02376

E POLLUTER PAYS PRINCIPLE AND ANSITIONAL PERIOD MEASURES IN A NAMIC SETTING,
o Univ. (Norway).
. Forsund.
edish Journal of Economics, Vol 77, No 1, p 56-1975.

criptors: *Pollution taxes(Charges), mporal distribution, Waste treatment, Op-zation, Decision making, Mathematical dels, Costs, Evaluation, Government supports, ital costs, United Nations.
ntifiers: International organizations, Pollution s Principle, Aggregated pollutants, OECD.

OECD countries have accepted the 'Polluter s Principle' as a basis for policy-making in en-nmental matters, There is a problem in in-reting and implementing this generally ac-ted policy. The usual application of the princi-is through effluent charges and direct regula-. Any analysis of the principle normally is con-ted in a static time frame. This study examines dynamic implications of the principle from a roeconomic standpoint using the position of an vidual firm. The approach used involves an ap-ation of Pontryagin's maximum principle to a solution. The particular problems examined the accumulation of pollution over time where ironment damage depends not on the rate of lution but on the total amount to date. Also con-ered is the accumulation of capital stock for the oval of pollutants from a production process the transitional problems faced by new and old ns with regard to pollution control standards. effect of the principal is examined from the ition of both efficiency and equity. (Carpenter-sconsin)

W76-02377

WATER QUALITY MONITORING AND RIVER BASIN PLANNING: A CRITIQUE AND SOME RECOMMENDATIONS,
Rutgers-The State Univ., New Brunswick, N.J. Div. of Urban Studies.
For primary bibliographic entry see Field 5A.
W76-02378

ANALYSIS OF COST SHARING PROGRAMS FOR POLLUTION ABATEMENT OF MUNICIPAL WASTEWATER,
National Bureau of Standards, Washington, D.C. Building Economics Section.
H. E. Marshall, and R. T. Ruegg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 420, $6.00 in paper copy, $2.25 in microfiche. Report No EPA-600/5-74-031, November 1974. 146 p, 10 fig, 11 tab, 73 ref, 1 append. EPA-IAG D4 H 374.

Descriptors: *Cost sharing, *Sewage treatment, *Water pollution control, *Federal government, *Equitable apportionment, *Optimization, Institutional constraints, Use rates, Local governments, Cost allocation, Operating costs, Economics of scale, Capital costs, Grants, Economic efficiency, Treatment facilities, Legislation, Motivation.

The existing federal cost-sharing arrangements for sewage treatment facilities are evaluated for their national efficiency and equity. The study identifies action that would increase the local share of pollution abatement costs; reduce the cost-sharing bias toward capital-intensive and eligible land-intensive projects; reduce the cost-sharing bias for some plant over nonplant techniques; increase the federal and local expenditures on nonplant techniques; increase the community demand for nonplant techniques; and increase the degree of pollution abatement per national dollar spent. Discussed in detail are the existing cost-sharing programs and institutional constraints, cost sharing by other agencies, conditions for efficiency, least cost techniques to the nation, economies of scale, and the characteristics of equity. Also evaluated are effects of user fees on cost shares, legislated user fees and their interpretations, interest charges on user fees, and the implications of fees. The findings are that the same percentage of cost-sharing should be allocated for all waste treatment techniques, the same percentage of cost shares be allocated to all cost categories (operation, maintenance, etc.), the same percentage of cost shares be allotted to communities of all sizes, user fees should be returned to the granting agency, interest should be charged on industrial user fees, and institutional obstacles be eliminated. (Auen-Wisconsin)
W76-02379

IMPROVEMENT OF THE ENVIRONMENTAL AND ECONOMIC CHARACTERISTICS OF COOLING TOWERS: PART I OF II. HEAT REJECTION FROM HORIZONTAL TUBES TO SHALLOW FLUIDIZED BEDS,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
B. R. Andeen, L. R. Glicksman, and W. M. Rohsenow.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 440, $7.50 in paper copy, $2.25 in microfiche. Report No MIT-EL 74007 (HTL 80047-85), June 1974. 189 p, 54 fig, 8 tab, 31 ref, 7 append.

Descriptors: *Powerplants, *Cooling towers, *Heat transfer, Heat exchangers, Thermodynamic behavior, Draft tubes, Economics, Particle size, Capital costs, Operating costs, Model studies, Correlation analysis, Transmissivity, Design.
Identifiers: *Heat rejection, Dry cooling towers, Fluidized beds, Waste heat.

The applicability of using fluidized beds as a means of enhancing heat transfer coefficients in air cooled heat exchangers, particularly in power-plant dry cooling towers, is evaluated. Various fludized bed models, as cited in literature, are discussed and an experimental program is described. An economic comparison between a power plant sized finned tube cooling tower and fluidized bed cooling tower is made using an optimized design program. The design considers the most economically favorable heat exchanger by optimizing heat transfer and thermodynamic relations with economic trade-offs. The design routine, give the performance and characteristics dimensions of the heat transfer surface, efficiencies, cost factors, and the yearly atmospheric temperature profile, designs a heat exchanger. The program then minimizes the incremental increase in the average yearly cost of power generation resulting from the use of a dry cooling tower by systematically varying the design of the heat exchanger and the turbine back pressure. The incremental cost represents all costs associated with adding a dry cooling tower to the system and maintaining the same net generating power. The incrementatl cost is figured from various capital costs and maintenance and operating costs. (Auen-Wisconsin)
W76-02381

POLLUTION ABATEMENT AND ECONOMIC GROWTH: AN APPLICATION OF THE VON NEUMANN MODEL OF AN EXPANDING ECONOMY,
Bureau of Economic Analysis, Washington, D.C.
J. E. Cremeans.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A003 151, $4.00 in paper copy, $2.25 in microfiche. Office of Naval Research, Naval Research Logistics Quarterly, Vol 21, No 3, p 525-542, 1974. 2 fig, 16 tab, 7 ref.

Descriptors: *Gross National Product, *Pollution abatement, Leontief models, Mathematical models, Input-output analysis, Economic impact, Linear programming.
Identifiers: *von Neumann model.

A generalised von Neumann model of an expanding economy allows the production of joint products and the use of alternative processes. Normal economic models include only those commodities produced and sold within the system; outputs with negative effects, such as pollution, 'bads' are ignored as being external to the system. These external outputs can be incorporated as outputs in a model and in many cases production alternatives are available that allow for varying degrees of pollution with production. A von Neumann growth model is applied to these circumstances explicitly incorporating pollution and allowing for alternative processes with varying degrees of pollution output. Difficulties were encountered in applying this approach but the results seem sufficiently worthwhile to continue with its development. The study includes an examination of the relationhsip between pollution reduction and economic growth. Examples used cover direct control of pollution, demand for a reduction in pollution, and using an exogenous constraint to reduce total pollutants produced, includes the calculation of an effluent charge. This approach does allow the effect of pollution abatement on the price structure to be determined directly. (Carpenter-Wisconsin)
W76-02385

HYGIENIC STANDARDIZATION OF DD AND DDB COMPOUNDS IN WATER BODIES, (IN RUSSIAN),
Novosibirsk Sanitary Research Inst. (USSR).
For primary bibliographic entry see Field 5B.
W76-02406

ENVIRONMENTAL CONSIDERATIONS IN FUTURE ENERGY GROWTH.
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 6G.
W76-02428

FACTORS IN THE ELIMINATION OF THE IMMATURE STAGES OF ANOPHELES QUADRIMACULATUS SAY IN A WATER LEVEL FLUCTUATION CYCLE,
Johns Hopkins Univ., Baltimore, Md. School of Hygiene and Public Health.
E. M. Darrow
American Journal of Hygiene, Vol 50, p 207-235, 1949. 7 fig, 17 tab, 22 ref.

Descriptors: *Mosquitoes, *Immature growth stage, *Water level fluctuations, *Insect control, Reservoirs, Mortality, Southeast U.S., Public health, Larval growth stage, Viability, Climates, Aquatic plants, Soil moisture, On-site investigations, Tennessee Valley Authority, Vectors(Biological).
Identifiers: *Anopheles quadrimaculatus, Malaria, Predators.

Mechanisms of water levels fluctuations to control Anopheles quadrimaculatus, a mosquito malaria vector in Tennessee Valley Authority impoundments were studied. During draw-down, 75-100% of larvae migrated with the receding water. Stranded larvae numbers were inversely proportional to water level recession rate and directly proportional to intersection values in the dewatered area. All stages were equally susceptible to stranding. Daytime mortalities were increased by predators; there was lesser mortality at night. Daytime mortality rates of stranded larvae and pupae correlated closely with evaporation. Exposure to predators and climate for 8 hours on clear summer days killed 92% of larvae and 75% of pupae. Degree of soil moisture was correlated with mortality. Saturated air was more lethal at 31C than 25C. First stage larvae were more susceptible to dessication than fourth stage larvae. Pupae exposed on soil to saturated air survived to eclosion as well as controls kept in water, but the proportion able to transform into adults was only 55-72% of controls. Eggs kept moist for 0.2-0.3 of the total embryonation period acquired resistance to desiccation. At 100% relative humidity eggs continued to develop out of water on a dry substratusm. (Buchanan-Davidson--Wisconsin)
W76-02430

WATER MANAGEMENT PLANNING FOR MALARIA PREVENTION IN THE DAMODAR VALLEY, INDIA,
Disease Center, Savannah, Ga. Communicable.
J. M. Henderson.
American Journal of Tropical Medicine and Hygiene, Vol 4, No 6, p 1091-1102, 1956.

Descriptors: *Human diseases, *Vectors(Biological), *Mosquitoes, *Asia, Control, Epidemiology, Water resources development, Multiple-purpose projects, Habitats, Irrigation systems, Water level fluctuations.
Identifiers: *India, *Malaria, Damodar Valley Corp.(India), Anopheles.

This multi-purpose program, in West Bengal and Bihar on the Damodar River and its tributaries, includes flood control, irrigation, reservoirs, barrage ponds, a thermal electric plant, a power transmission network, navigation, access highways to the impoundments, and water supply to Calcutta. The malaria transmission season is normally between July and December; 46 species and subspecies of Anopheles have been identified. Anopheles culicifacies and A. philippinensis are the major species. Recommendations for malaria control include clearing of trees and brush within and immediately beyond full pool levels of impoundments, draining depressions in drawdown-refill zones, varying pond water levels, and drawdown and improvement of the Bokaro Pond shoreline. Water form Durgapur Pond will provide supplemental water for rice crops during the monsoon season and will be the primary water supply during the dry season. Irrigation presents a major malaria hazard. There are conflicting opinions as to how to curb 'irrigation malaria'; one suggests raising the water table by excessive irrigation and avoiding drainage; another recommends minimum water application and maximum drainage. Recommendations are made for research on anopheline ecology to evaluate cause and effect relationships between the water table, malaria, and irrigation practices. (Buchanan-Davidson--Wisconsin)
W76-02432

NATURAL BIOLOGICAL CONTROL OF THE SALT MARSH MOSQUITO IN THE ACID MINE DRAINAGE SWAMPS IN WESTERN KENTUCKY,
Speed Scientific School, Louisville, Ky.
H. T. Spencer, C. D. Baker, C. Leuthart, and M. E. Shawler.
In: Fifth Symposium on Coal Mine Drainage Research, October 1974, Louisville, Kentucky, p 172-180, 1 fig, 3 tab, 9 ref.

Descriptors: *Biocontrol, *Salt marshes, *Mosquitoes, *Brackish water, Mine drainage, Swamps, *Kentucky, Aquatic plants, Environmental effects, Insect control, Chara, Dissolved oxygen, Fishes, Dragonflies.
Identifiers: *Aedes sollicitans, Hopkins County(Ky), Clear Creek Swamp(Ky), Button bush, Duckweed, Damselflies, Diving beetles, Predators.

Runoff from deep mines, spoil, and deforestation has created acid swamps covering large areas of western Kentucky. Some tributaries of the Tradewater Basin which had been free-flowing, with definite banks and channels, now cover 10,000 acres of once forested land. Each spring flooding creates an ideal habitat for mosquitoes, especially the salt marsh mosquito, Aedes sollicitans. Major control efforts have been in Hopkins County, which contains most of the Clear Creek watershed. Mosquitoes were epidemic in 1956 when they were controlled by spraying, but now appear under control by the ecosystem. The once turbid water now stays clear permitting extensive Chara blooms in mosquito breeding areas. Chara has a history as a mosquito control agent by increasing dissolved oxygen in the surrounding water; high dissolved oxygen concentration is considered inhibitory to the development of the mosquito larvae. Extensive regrowth of button bush on deforested areas permits duckweed, another mosquito control agent, to flourish. Many insects are mosquito predators, with the more aggressive in great numbers; particularly effective are the dragonfly, damselfly, and diving beetle (Dysticidae). Improved mining and reforestation practices will enhance biological diversity through improved water quality and the continued biocontrol of the Culicidae. (Auen-Wisconsin)
W76-02433

INVESTIGATION RELATED TO PREVENTION AND CONTROL OF WATER POLLUTION IN THE U.S. TNT INDUSTRY,
Edgewood Arsenal Aberdeen Proving Ground, Md. Chemical Lab.
For primary bibliographic entry see Field 5D.
W76-02441

ABATEMENT OF NITROBODIES IN AQUEOUS EFFLUENTS FROM TNT PRODUCTION AND FINISHING PLANTS,
Army Natick Lab., Mass.
For primary bibliographic entry see Field 5D.
W76-02442

PRODUCTION AND CONTROL OF FLOO
WATER MOSQUITOES INCIDENTAL T
WATER LEVEL OPERATIONS ON RESE
VOIRS OF THE TENNESSEE VALL
AUTHORITY,
Tennessee Valley Authority, Wilson Dam, A
Div of Health and Safety
W E Snow
In: Proceedings 10th International Congress of E
tomology, Vol 3, p 745-750, 1956 (1958). 3 fig.

Descriptors: *Insect control, *Water level fluctu
tions, *Reservoirs, Tennessee Valley Authori
Insecticides, Viability, Larvae, Tennessee Riv
Dieldrin, DDT, Victors(Biological)
Identifiers: Floodwater mosquitoes, Aed
Psorophora.

Floodwater mosquitoes, Aedes and Psorophor
are well established in the zone above the summ
pool level in certain Tennessee River(TVA) res
voirs. In the spring when this zone is surcharged
strand flotage for malaria control, the
mosquitoes hatch. If surcharge and recession ta
about five days, many larvae become stranded.
water remains in the zone for several wee
Aedes vexans generally emerge. Weekly cyclic
fluctuations and seasonal recessions help cont
floodwater mosquitoes. Even when rain occurs
the upper end of the cycle and mosquitoes hatc
scheduled recession the next few days strands t
larvae. Seasonal water level recession is do
regularly on many reservoirs by gradually relea
ing stored water during drier periods. A recessi
rate of 0.2-0.3 feet per week beginning shortly b
fore July 1 adequately controls mosquitoes. Wh
stored water remains in the marginal growth zo
for several weeks in the spring before recession
begun, small numbers of Aedes vexans usual
emerge. Sometimes when the growth zone
periodically flooded during the summer with dra
down periods of several weeks, many Aedes ve
ans develop. DDT is used to control mosquitoe
Use of dieldrin is being considered for floodwat
mosquito control on river and storage reservo
margins. (Buchanan-Davidson--Wisconsin)
W76-02443

WATER LEVEL MANAGEMENT FOR TH
CONTROL OF ANOPHELES QUADRIMACU
LATUS IN THE TENNESSEE VALLEY,
Tennessee Valley Authority, Wilson Dam, Al
Malaria Control Branch.
T. F. Hall.
In: Proceedings of the 38th Annual Meeting
New Jersey Mosquito Extermination Associatio
Vol 38, 1951, p 84-91. 8 ref.

Descriptors: *Insect control, *Water level fluctu
tions, *Mosquitoes, *Reservoirs, Tennesse
River, *Tennessee Valley Authority, Flotsan
Larvicides, Public health, Vectors(Biological
Vegetation, Shoreline cover, Aquatic weed co
trol.
Identifiers: *Anopheles quadrimaculatus, Malar
control.

The Tennessee Valley Authority malaria contr
program is directed primarily at control o
Anopheles quadrimaculatus, the only know
malaria vector in the region. To prevent malari
transmission, naturalistic, chemical, and mechan
cal methods are used; the most important is wate
level management. On main river reservoirs, th
pool is filled into a surcharge zone before th
growing season; a flood surcharge picks up an
strands winter debris. The pool is maintained nea
top summer pool level as long as possible to co
trol marginal plants. Water level is then fluctuate
to disrupt water line vegetation and larval breedin
habitats. Cyclical fluctuation (dropping the leve
one foot and refilling 0.9 foot each week) until th
breeding season ends keeps the water level belo
the encroaching vegetation band. Winter draw
downs every 2-3 years attenuate submersed plan
growth. At Wilson Dam a constant pool size is fol
lowed by weekly cyclical fluctuations of about tw

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. Management of tributary stream storage rvoirs consists of a constant pool phase fol- ed by seasonal recession. If summertime filling eeded, reservoirs should be full about three ks before recession starts. In areas where er level management has not been completely quate, larvicides and vegetation control opera- s are used as supplementary techniques. chanan-Davidson--Wisconson)
5-02447

TENTIAL ENVIRONMENTAL PROBLEMS DREDGING AND DREDGED MATERIAL POSAL: DREDGED MATERIAL DISPOSAL TERIA,
as Univ. at Dallas, Richardson. Inst. for En- nmental Sciences.
primary bibliographic entry see Field 5C.
6-02449

PORT TO INTERNATIONAL JOINT COM- SSION, UNITED STATES AND CANADA, EAT LAKES WATER QUALITY,STATUS OF RTINENT EPA RESEARCH,
tional Environmental Research Center, Corval- Oreg.
F. Bartsch, C. L. Frank, and S. Peterson.
ailable from the National Technical Informa- n Service, Springfield, Va 22161, as PB-239 260, 50 in paper copy, $2.25 in microfiche. Report EPA-660/9-74-002, December 1974. 16 p, 6 ref.

scriptors: *International Joint Commission, reat Lakes, *Water pollution effects, Pollu- ts, Nitrilotriacetic acid, Polychlorinated henyls, Viruses, Sewage effluents, Disinfec- n, Epidemiology, Eutrophication, Toxicity, h.

ne of the major segments of research activities nducted by the Environmental Protection Agen- and which were the recommended objectives of International Joint Commission in its 1973 an- l report and partial results related to rilotriacetate, viruses, disinfection of municipal stewater, and the effect of polychlorinated henyls on fish are summarized. NTA appears to ve no dramatic effects on algal growth rates and no inhibitory effects on freshwater eutrophica- n processes. In contrast, small amounts of NTA marine estuarine systems may produce a trace tals deficiency, thus limiting productivity. NTA gradation products in groundwater and energy nsfer effects; and the extent of NTA toxicity to natic communities are being investigated. search is directed to waterborne viruses, their ssible health hazards, their detection; as infec- ts of blue-green algae; and epidemiology. The al studies also include airborne contamination m sewage treatment plants. Wastewater disin- tion investigations include effects of disinfec- n on aquatic organisms and developments of as- ciated technology for effluent disinfection. Pro- ts are scheduled to examine the state-of-the-art several disinfectgnts and their toxicity. Results fish contamination by PCBs indicate that oclors are extremely toxic and of possible man hazard. Data generated can be the basis for llution standards. (Auen-Wisconsin)
76-02451

GIENIC PROBLEMS OF THE DESIGN, ONSTRUCTION AND OPERATION OF ROUP WATER SUPPLY SYSTEMS, (IN RUS- AN),
uchno-Issledovatelskii Institut Selskoi Gigieny, ratov (USSR).
r primary bibliographic entry see Field 5B.
76-02477

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A LAND CAPABILITY MODEL FOR THE LOWER LAKE MONROE WATERSHED,
Indiana Univ., Bloomington. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W76-02002

ANALOG-MODEL ANALYSIS OF HYDROLOGIC EFFECTS OF SEWERAGE IN SOUTHEAST NASSAU AND SOUTHWEST SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 5B.
W76-02146

ANALYSIS OF A MULTIPURPOSE WATER RESOURCE SYSTEM IN SOUTHEASTERN MEXICO,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. R. Kunkel.
Ph D Dissertation, 1974. 224 p, 35 fig, 39 tab, 2 append, 78 ref.

Descriptors: *Water resources development, *Planning, *Methodology, *Decision making, *Mexico, River basin development, Water resources, Cost-benefit analysis, Alternate planning, Project purposes, Social aspects.
Identifiers: Developing countries, Papaloapan River Basin(Mex), Cost-effectiveness methodology.

Justification for the construction of a water resource project in developing countries has been traditionally based on benefit-cost analysis. This study demonstrates the use and advantages of the cost-effectiveness methodology in a developing country and is applied to water resource development in the Papaloapan River Basin in southeastern Mexico. Project-related social variables are included, and a comparison to traditional benefit-cost analysis is emphasized. The planning process starts by identifying desired goals which are then mapped into specifications. Quantitative and qualitative criteria relating specifications to system capabilities are defined, and the capabilities of district alternative systems are determined and compared. Then, using either a fixed-cost or fixed-effectiveness approach, the alternative system which most closely satisfies goals is selected. The methodology suggests improved ways of defining goals and criteria in developing countries and sets forth a concise framework upon which developing countries may base future water resource planning, design and operation. (Mills-Arizona)
W76-02157

ESTABLISHING A PROCESS FRAMEWORK FOR LAND USE PLANNING,
Forest Service, (USDA), Berkeley, Calif. Watershed Systems Development and Application Unit.
L. J. Lundeen.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona.

Descriptors: *Planning, *Land management, *Land use, *Water resources, Land development, Conservation, Land classification, Land resources, Natural resources, Evaluation, Land appraisals, Systems analysis,Simulation analysis, Social aspects, Decision making, Economics.
Identifiers: *Land use planning.

In order to be effective, the operational aspects of land use planning must be tied to a well defined planning process. The framework for this process includes a set of components which are important in solving planning problems and are linked together in a design related to the basic concepts of decision analysis oriented to natural resource problems. Detailed description can be added to the process framework to adjust it to a specific problem, study area, or study level. Major components in the framework which are discussed include an objectives and goals spectrum, problem formulation, physical characterization of the land, social and economic demands analysis, identification of management alternatives and specific activities, simulation of resource response, allocation of resources, visual quality analysis, transportation system analysis, and a data management system. The basic concept of a systematic, decision-oriented procedure has been recognized as a key factor in effective planning or problem solving. (Robinett-Arizona)
W76-02241

A HYDRONOMIC ANALYSIS OF FOREST MANAGEMENT ALTERNATIVES FOR ENVIRONMENTAL QUALITY: A CASE STUDY OF ITASCA COUNTY,
Minnesota Univ., St. Paul. Coll. of Forestry.
For primary bibliographic entry see Field 6B.
W76-02362

WATER QUALITY MONITORING AND RIVER BASIN PLANNING: A CRITIQUE AND SOME RECOMMENDATIONS,
Rutgers-The State Univ., New Brunswick, N.J. Div. of Urban Studies.
For primary bibliographic entry see Field 5A.
W76-02378

POLLUTION ABATEMENT AND ECONOMIC GROWTH: AN APPLICATION OF THE VON NEUMANN MODEL OF AN EXPANDING ECONOMY,
Bureau of Economic Analysis, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-02385

6B. Evaluation Process

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--UPPER MISSISSIPPI REGION,
Geological Survey, Sacremento, Calif.
R. M. Bloyd, Jr.
Available from Supt of Documents, GPO, Wash, DC 20402, price $0.30. Professional Paper 813-B, 1975. 22 p, 8 fig, 9 tab, 26 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Hydrologic data, *Mississippi River basins, Water supply, Water utilization, Aquifer characteristics, Water yield, Groundwater recharge, Water quality, Potential water supply, Evaluation.
Identifiers: *Upper Mississippi Region.

The Upper Mississippi Region in general is rich in water--surface water is plentiful, and groundwater is a large, important, and manageable resource. This report emphasizes the role of groundwater in the region. Total potable groundwater in the outwash and alluvial aquifers in the Mississippi River valley and the subbasins is about 45,000 billion gallons. Groundwater in storage in other aquifers of the region is probably several times that in the outwash and alluvial aquifers. Estimated groundwater recharge in the subbasins is 23,000 mgd. Groundwater use by domestic, commercial, and rural interests is only 4 percent of recharge. Groundwater use (1965) by industry is only 3 percent of

recharge. Part of the region has groundwater resources capable of satisfying more than local needs. Specifically, the water in the outwash and alluvial aquifers in much of the valley of the Mississippi River south of St. Paul, Minn., of the Illinois River, the lower Minnesota River, the upper Wisconsin River, the lower Black River, the Wapsipinicon River, the lower Rock River, and the upper Des Moines River can be considered a regional resource. Groundwater in these areas could supply approximately 20 million additional people. (Woodard-USGS)
W76-02141

ANALYSIS OF A MULTIPURPOSE WATER RESOURCE SYSTEM IN SOUTHEASTERN MEXICO,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W76-02157

A GRAPHICAL PROCEDURE FOR CLASSIFYING AQUIFER MANAGEMENT STRATEGY,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W76-02159

THE EFFECT OF DEVELOPMENT ON GROUNDWATER IN THE PARKER STRIP,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W76-02236

A HYDRONOMIC ANALYSIS OF FOREST MANAGEMENT ALTERNATIVES FOR ENVIRONMENTAL QUALITY: A CASE STUDY OF ITASCA COUNTY,
Minnesota Univ., St. Paul. Coll. of Forestry.
A. P. O'Hayre, J. C. Clausen, and A. C. Mace, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 046, $6.00 in paper copy, $2.25 in microfiche. Minnesota Water Resources Research Center, Minneapolis, Bulletin No 83, Aug 1975, 125 p. 14 fig, 14 tab, 131 ref, 6 append. OWRT B-053-MINN(1).

Descriptors: *Input-output analysis, Hydrology, Environmental control, *Forest management, *Minnesota, Methodology, *Alternative water use, *Water utilization, Economics, Evaluation, Water demand, Alternative planning.
Identifiers: Itasca County(Minn), *Hydronomic analysis, *Environmental quality.

The objective was to develop a methodology that integrates water use and environmental quality parameters into an economic system to evaluate forest management alternatives. The input-output technique was the general methodology used for integrating water use. Direct and direct-plus-indirect water use coefficients (total withdrawn and consumptive) were determined for each of the 34 economic sectors in Itasca County, Minnesota. An example was developed that compared the water yield from the harvesting alternatives of clear-cutting, strip cuts, and selection cuts. A zero water use coefficient was used for timber production, under surplus conditions, and the water required was 44 million gallons. This value was low in relation to the increased water yield. Under assumed water scarcity situations, the water use coefficient was 175,560 gallons/dollar of output for timber production, and the water required became 16.2 billion gallons which was much greater than the increased water yield. (Waelti-Minnesota)
W76-02362

BOISE POST-AUDIT STUDY, HYDROLOGY SUPPORT STUDY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
C. C. Warnick, and C. E. Brockway.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 148, $6.75 in paper copy, $2.25 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, June 1974. 157 p, 36 fig, 27 tab, 63 ref. OWRT C-4202(9061)(1).

Descriptors: Water management(Applied), Hydrology, *Multipurpose projects, *Idaho, Water resources development, Flood control, Irrigation, *Oregon, *Return flow, *Reservoir operation, *Water utilization.
Identifiers: *Boise project(Idaho-Oregon).

This is the first support study for a Case Study of Federal Expenditures on a Water and Related Land Resource Project: Boise Project, Idaho and Oregon. Although development in the Boise River Basin has been taking place over the past 110 years, the Boise Project is typical of numerous reclamation developments throughout the Western United States. The Boise Project has been the subject of continuous planning and development effort by both the U.S. Corps of Engineers and the U.S. Bureau of Reclamation since 1905. For these reasons the Boise area was chosen as the case study for this research. This sub-project report provides hydrologic information for the Boise River on diversions and return flows, reservoir operation, irrigation systems, water law and floods. The data is presented as a basis for subsequent phases of a multidisciplinary study to assess federal expenditures on a water and land resource project. Information on both surface water and ground water aspects of the Boise Valley is included. (See also W76-02373 and W76-02374)
W76-02372

BOISE POST-AUDIT STUDY, PLAN OF STUDY SUBPROJECT REPORT,
Idaho Dept. of Water Resources, Boise; and Idaho Dept. of Water Resources Board, Boise.
R. W. Schermerhorn.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 149, $4.00 in paper copy, $2.25 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, June 1974. 40 p, 6 fig, 1 tab, 2 maps. OWRT C-4202(9061)(2).

Descriptors: *Decision making, *Project post-evaluation, *Idaho, *Oregon, Government supports, Expenditures, Water resources development.
Identifiers: *Boise project(Idaho-Oregon).

This is the second support study for A Case Study of a Federal Expenditure on a Water and Related Land Resource Project, Boise Project, Idaho and Oregon. As modern technology, affluence and population growth place more demands on water use, the public is demanding better management and use of our water resource. The purpose of this study is to present an analysis of the role of the federal government in water development in the Boise Project of Idaho and Oregon. As a result of this study and two related support studies, the following conclusions, and recommendations are presented and discussed: -- Ex-post analysis of a selected water resource project can contribute to more responsive planning, decision making and better allocation of resources. -- Ex-post analysis, structured so as to utilize the Principles and Standards, will provide maximum utility to the planner. -- Ex-post analysis should be structured following societal objectives rather than traditional water use functional objectives. The Principles and Standards, with modification, can accommodate this approach. -- The influence of exogeneous forces on beneficial and adverse effects must be considered if a realistic appraisal is to be obtained through an ex-post analysis. (See also W76-02372 and W76-02374)
W76-02373

BOISE POST-AUDIT STUDY, ECONOMIC A ECOLOGICAL HISTORY SUPPORT STUDY,
Idaho Univ., Moscow. Dept. of Geography
H. H. Caldwell, and M. Wells
Available from the National Technical Information Service, Springfield, Va 22161 as PB 248 [illegible] $7.75 in paper copy, $2.25 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, June 1974. 18, p, 21 tab, plates, 125 ref, 3 append. OWRT C-4202(9061)(

Descriptors: *Land use, *Land development, banization, Community development, Elec power demand, *Government finances, *Ida *Oregon, Reservoirs, Diversion dams, *Ecolo History, *Economics, Irrigation
Identifiers: Boise Valley(Idaho), Deer Flat Re voir, Arrowrock, Anderson Ranch, Lucky Pe Ada County, Canyon County, *Boise ject(Idaho-Oregon).

This is the third support study for A Case Study Federal Expenditures on a Water and Rela Land Resources Project: Boise Project, Idaho Oregon. Prior to the Boise Project, any extens irrigation in the Boise area was confined to flood plain and Eagle Island. Federal expenditu in area dams and reservoirs provided irrigat water for the entire agricultural area for the len of the growing season. Without these expe tures, irrigation would be far more dependent groundwater sources, and probably would cove smaller area. Many ecological changes and dam in the area were not as a result of the Boise P ject, but of revious mining and logging operati in the upper reaches and irrigation in the lower ley. Post-project pollutants include industrial fluent, urban surface runoff, and topsoil sedim loss. Initial study attempts to differentiate proj and non-project impacts by specific time interv were handicapped by widespread pre-existing rigation, the long time interval between congr sional discussion of authorization and complet of the project, the impact of private entrepeneu the role of the railroad in route and townsite sel tion, and the role of Boise as state capitol, tra portation node, largest city and region and fede trade center. (See also W76-02372 and W76-0237
W76-02374

OPTIMAL LEASING POLICY FOR T DEVELOPMENT OF OUTER CONTINENT SHELF HYDROCARBON RESOURCES,
Amos Tuck School of Business Administrati Hanover, N.H.
For primary bibliographic entry see Field 6E.
W76-02375

THE ECONOMIC VALUE OF REMOT SENSING OF EARTH RESOURCES FRO SPACE: AN ERTS OVERVIEW AND TH VALUE OF CONTINUITY OF SERVICE. VO V. INLAND WATER RESOURCES.
ECON, Inc., Princeton, N.J.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as N75-1420 $11.00 in paper copy, $2.25 in microfiche. Repo 74-2002-10, October 1974. 412 p, 14 fig, 86 ta NASW-2580.

Descriptors: *Water resources, *Remote sensin *Economic justification, *Water manag ment(Applied), Estimated benefits, Margin benefits, Mapping, Flood control, Reservoir s ing, State governments, Ice, Snow, Glacier Monitoring, Warning systems, Budgeting, Legisl tion, Satellites(Artificial), Data collections, Wat pollution control, Resources developmen Federal jurisdiction.
Identifiers: Earth Resources Technology Satellit Case study.

Annual hard benefits of $57.2 million were est mated for an Earth Resources Technology Sate lite (ERTS) system in inland water resourc management. Of this, $50.6 million can be a

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ed to new capabilities for managing inland r resources, especially in the fields of power ation, agriculture, and urban water supply. figure was based on results of an ad hoc case of the Feather River, California. Soft annual fits of $50.1-121.1 million were estimated for d water resources. These were obtained in the of equal capability (cost savings) and in- ed capability (equal budget benefits) and estimated by applying conservative assump- to federal budgeting information, congres- l appropriation hearings, and ERTS technical bilities. No quantitative estimates of benefits made in the area of monitoring and con- ng water pollution but they almost certainly . Five appendices contain detailed documen- ns of benefits by resource management func- summarize applicable federal budgets, laws, statutes; describe Corps of Engineers remote ng program pertinent to inland water urces; detail USDA Soil Conservation Service requirements; describe the ad hoc Feather r case study; and contain abstracts of recent rts of inland water resources by ERTS prin- investigators. (Buchanan-Davidson--Wiscon-

-02382

DEMAND FOR AGRICULTURAL WATER TAH,
n Water Research Lab., Logan.
primary bibliographic entry see Field 6D.
-02383

ONOMICS OF GREAT LAKES BULK CAR- RS IN WINTER OPERATIONS,
higan Univ., Ann Arbor. Dept. of Naval nitecture and Marine Engineering.
Nowacki, H. Benford, M. Kaldjian, and D. tin.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as COM-73- 1, $6.75 in paper copy, $2.25 in microfiche. ort No 135, August 1972 (MA-RD-900-73038). p, 21 fig, 9 tab, 54 ref, 4 append. MA 1-35487.

criptors: *Cost-benefit analysis, *Navigation, eat Lakes, *Winter, Transportation, Ships, l lakes, Ice breakup, Computer programs, nomic prediction, Investment, Operating s, Alternative planning, Taxes.
ntifiers: *Shipowners, Ship designs, Bulk car- s, Winter shipping.

ethod for predicting costs and benefits accru- to any Great Lakes shipowner who might en- e in various lengths of extended season opera- s is designed in the form of a computerized del of general applicability. A secondary objec- is to help designers optimize ship designs in- ded for ice operations. The analyses consider design, weights, investments, variations in ice ditions, speed and power in open water and in annual transport capability, operating costs, measures of merit. The computer program is ed on inputs, implicit assumptions, output, and mple study. Although the results should be in- preted cautiously, the trends suggest that for sting ships with present ice technology an ex- ded season is just marginally attractive pro- ed that the present level of icebreaking and orting support is maintained; but on a fleet- le basis the extended season allows the more fitable ships to be fully exploited. Major ice ptions of the ships is not indicated but newly structed, modern and more profitable ships uld definitely support a longer season and a re advanced level of ice technology in the ships. s report is superceded by Report No. 139 titled conomics of the Great Lakes Shipping in an Ex- ded Season', January 1973. (Auen-Wisconsin) 6-02384

LLUTION ABATEMENT AND ECONOMIC ROWTH: AN APPLICATION OF THE VON NEUMANN MODEL OF AN EXPANDING ECONOMY,
Bureau of Economic Analysis, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-02385

ENVIRONMENTAL CONSIDERATIONS IN FUTURE ENERGY GROWTH.
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 6G.
W76-02428

PROJECT EVALUATION DURING INFLATION,
Johns Hopkins Univ., Baltimore, Md.
S. H. Hanke, P. H. Carver, and P. Bugg.
Water Resources Research, Vol 11, No 4, p 511-514, 1975. 23 ref.

Descriptors: *Interest rates, *Inflation(Economics), *Cost-benefit analysis, Prices, Project planning, Evaluation, Discount rates.
Identifiers: Opportunity cost.

Principles are given for dealing with price and interest rate projections when benefit-cost analysis of water resource projects must be performed using data which reflect expected inflation. Prices and interest rates must be considered simultaneously and consistently, that is, projected in either real or nominal terms. The Water Resources Council's recommendations as modified by the Water Resources Development Act of 1974 did not acknowledge the joint nature of price and interest rate projections, but recommended real prices be projected and real benefits and costs be discounted using a nominal interest rate. However real prices should be projected for undiscounted expected benefits and costs and real interest rates used to discount these values. The interest rate used with real prices should not be the recommended' adjusted nominal financial rate' or real financial rate, but the real opportunity cost rate. Because the prediction of relative prices is difficult, benefits from precision should be compared to costs in implementing benefit-cost procedures; usually this is only feasible for large shifts in relative values. (Buchanan-Davidson--Wisconsin).
W76-02444

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

TREATMENT OF COMBINED SEWER OVERFLOWS BY DISSOLVED AIR FLOTATION,
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5D.
W76-02074

INFILTRATION--INFLOW ANALYSIS,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-02170

LARGE DIAMETER SEWER AVERAGES $234.50 PER LIN FT.
For primary bibliographic entry see Field 5D.
W76-02175

BROADER LOAN PROGRAM INTRODUCED FOR MUNICIPAL SEWERAGE PROJECTS.
Water and Pollution Control, Vol 113, No 9, p 18-19, September 1975. 1 fig, 1 tab.

Descriptors: *Legislation, *Loans, *Sewers, *Sewerage, *Treatment facilities, Costs, Grants, Regional analysis, Design criteria, Municipal wastes, Financing.

The federal government of Canada, through the Central Mortgage and Housing Corporation (MCHC) has passed new legislation to provide additional financial assistance to provinces, municipalities, and municipal sewerage corporations. Eligible projects for aid are defined. These include: sewer treatment projects, such as treatment facilities, and trunk collector sanitary sewers; trunk storm sewer systems; and regional sewerage plans. Loans for sewage treatment facilities, trunk collector sanitary sewers, and trunk storm sewer systems may be made in an amont up to two-thirds the eligible cost of the project. Loan forgiveness is also possible, for about one-sixth of the eligible project costs as determined by CMHC, or 25% of the principal and 25% of the acrued interest with respect to loan advances as at the date of project completion. Grants are also made for the establishment or expansion of a sewage treatment project or the construction of a trunk storm sewer system where no loan has been made by CMHC. Grants are also available when the cost of a sewage treatment project imposes an excessive per capita burden on taxpayers. Additionally, CMHC may make a grant to a province or municipality not exceeding one half the cost of the preparation of a Regional Sewerage Plan. Eligivle project costs are defined, including construction costs, land costs, and the related costs of design and supervision, legal services, interim financing during the construction period and other costs as approved by CMHC. (Kramer-FIRL)
W76-02176

FOOD FROM SEWAGE. IT CAN BE DONE,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W76-02291

CRITERIA FOR DETERMINING FEASIBILITY OF RURAL WATER SUPPLY SYSTEMS IN LIVESTOCK PRODUCTION AREAS,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-02367

WHO WILL PAY FOR POLLUTION CONTROL.--THE DISTRIBUTION BY INCOME OF THE BURDEN OF THE NATIONAL ENVIRONMENTAL PROTECTION PROGRAM, 1972-1980,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-02376

THE POLLUTER PAYS PRINCIPLE AND TRANSITIONAL PERIOD MEASURES IN A DYNAMIC SETTING,
Oslo Univ. (Norway).
For primary bibliographic entry see Field 5G.
W76-02377

ANALYSIS OF COST SHARING PROGRAMS FOR POLLUTION ABATEMENT OF MUNICIPAL WASTEWATER,
National Bureau of Standards, Washington, D.C. Building Economics Section.
For primary bibliographic entry see Field 5G.
W76-02379

IMPROVEMENT OF THE ENVIRONMENTAL AND ECONOMIC CHARACTERISTICS OF COOLING TOWERS: PART I OF II. HEAT REJECTION FROM HORIZONTAL TUBES TO SHALLOW FLUIDIZED BEDS,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
For primary bibliographic entry see Field 5G.
W76-02381

PROJECT EVALUATION DURING INFLATION,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 6B.
W76-02444

6D. Water Demand

WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES, VOL I,
For primary bibliographic entry see Field 6E.
W76-02105

A RATIONAL WATER POLICY FOR DESERT CITITES,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3D.
W76-02229

SALINITY CONTROL PLANNING IN THE COLORADO RIVER SYSTEM,
Bureau of Reclamation, Denver, Colo. Water Quality Office.
For primary bibliographic entry see Field 3A.
W76-02230

WATER RESOURCE ALTERNATIVES FOR POWER GENERATION IN ARIZONA,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 3E.
W76-02243

BOISE POST-AUDIT STUDY, HYDROLOGY SUPPORT STUDY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W76-02372

THE DEMAND FOR AGRICULTURAL WATER IN UTAH,
Utah Water Research Lab., Logan.
M. H. Anderson, J. C. Andersen, J. E. Keith, and C. G. Clyde.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A001 077, $4.50 in paper copy, $2.25 in microfiche. Report PRWG100-4, September 1973. (Corps of Engineers Institute for Water Resources Report 74-4, AD786698). 60 p, 6 fig, 8 tab, 43 ref. DACW31-71-C-0063.

Descriptors: *Water demand, *Agriculture, *Utah, *Water resources development, *Economic feasibility, Irrigation, Water importing, Water resources, Optimization, Water utilization, Rotations, Regional analysis, Economic justification, Crop production, Cultivated lands, Model studies, Land development, Linear programming, Alternative planning, Consumptive use.

To provide economic information for decisions concerning development and use of water resources for agriculture in Utah, irrigated and potentially irrigable lands were estimated in all ten of its hydrologic subregions. Water use factors, crop rotation constraints, production costs, yields, product prices, and costs of bringing land into production were computed and used in a linear programming model to determine a normalized demand schedule for water use in agricultural production. Water available to the production model for each subregion was varied thus the model created a marginal value product at each level, these were combined to estimate relationships between water quantity and economic value. Most of Utah suffers from water shortage; production could be increased from irrigated land by using more water and/or water transfer from lands with low productivity to higher quality land. There are many examples of water waste. The model does not adequately evaluate the economic feasibility of water importation, but regions with the greatest development potential are identified. With present cost and price structures, agriculture could probably not economically justify most water importation schemes. Many promising areas for development have large water supplies but municipal and industrial uses are projected to remove agricultural land from production. (Buchanan-Davidson--Wisconsin)
W76-02383

6E. Water Law and Institutions

DEEPWATER PORT ACT OF 1974.
Public Law 93-627; 88 stat 2126, 1974. 25 p.

Descriptors: *Harbors, *Deepwater, *Environmental control, Construction, Legislation, Regulation, Control, Environmental effects, Public health, Ocean currents, Penalties(Legal), Ecology, Transportation, Water, Water law, Offshore platforms, Oceans, Oil spills, Ships.
Identifiers: *Deepwater Port Act, *Commerce, Licenses, Hazardous substances(Pollution).

This is an Act to regulate commerce, promote efficiency in transportation, and protect the environment, by establishing procedures for the location, construction, and operation of deepwater ports off the coasts of the United States. The Act provides that no person may engage in the ownership, construction, or operation of a deepwater port without a license. The Secretary of Transportation is authorized to promulgate regulations pertaining to application, issuance, transfer, renewal, suspension, and termination of licenses. The Secretary is also authorized to establish environmental review criteria consistent with the National Environmental Policy Act. Such criteria would include: the effect on the marine environment, oceanographic currents, land-based developments related to deepwater ports, human health and welfare, and other considerations deemed appropriate. Criminal and civil penalties are provided to enforce the Act. Provisions are also included relating to navigational safety, international agreements, recordkeeping and inspection, public access to information, judicial review, adjacent coastal states, antitrust review, and common carrier status. (Hoffman-Florida)
W76-02077

SAFE DRINKING WATER ACT.
For primary bibliographic entry see Field 5F.
W76-02078

RESOURCE SCARCITY, ECNOMIC GROWTH AND THE ENVIRONMENT.
Hearings--Subcommittee on Priorities and Economy in Governments, Joint Economic Committee, 93rd Congress, 1 st Sess, Dec 19, 20, 21, 1973. 192 p, 30 fig, 2 photo, 14 tab.

Descriptors: *Sewers, *Detergents, *Environmental effects, Chlorine, Soaps, Surface waters, Biodegradation, Water pollution, Wastes, Oil, Alkalis(Bases), Mercury, Phenols, Sewage disposal, Sewage effluents, Sewerage, Water law, Legal aspects, Water.
Identifiers: *Petrochemicals, Congressional Hearings, Residues, Mercury pollution, Hazardous substances(Pollution).

These Congressional Hearings on Resource Scarcity discuss various problems relating to water and other resources. For example, one major petrochemical product-synthetic detergents - produces appreciable deleterious effects on the environment. This occurs because of phosphates which enter surface waters from municipal sewage systems. Many such petrochemical products are not unique, but merely replace older pre-existi products such as soap that were much less harmf to the environment. Even the newer detergent which are regarded as degradable leave a resid of phenol which may not be degraded and may a cumulate in surface waters. The impact of chlori and mercury on surface waters is also brief discusses. (Parrish-Florida)
W76-02079

GREAT LAKES WATER QUALITY 1974 A NUAL REPORT.
International Joint Commission-United States a Canada Great Lakes Water Quality Board
For primary bibliographic entry see Field 5G.
W76-02080

ILLINOIS LAWS RELATING TO WATE WAYS, 1973.
Illinois State Dept. of Transportation, Springfiel Div. of Waterways.

Descriptors: *Illinois, *Water law, *Water right Jurisidiction, *Transportation, *Inland wate ways, Flood control, Flodd damage, River, Lake Streams.

The statues contained herein refer primarily t rivers, lakes and streams, and to the authority, du ties and jurisdiction of the Department of Trans portation and its Division of Waterway Reference is made to the chapters and paragraph in the Illinois Revised Statutes or the specifi Public Act, wherein can be found the complet acts of which, perhaps, only certain sections ar included herein. (See W76-02082 thru W76-02089)
W76-02081

THE CIVIL ADMINISTRATIVE CODE (PROVISIONS RELATING TO ILLINOIS STATE AGENCIES CONCERNED WITH WATERWA LAW).
Ill. Rev. Stat., Chap. 127, Par 49-52 (1973). 2 p.

Descriptors: *Administrative agencies, *Management, *Water manatement(Applied), *State governments, *Illinois, Eminent domain, Real property, Administration, Planning, Rivers, Lakes, Canals, Harbors, Navigable waters, Construction, State governments.
Identifiers: *Department of Transportation(Illinois).

Under the General Provisions of the Illinois Revised Statutes, the Department of Transportation may create and establish offices, divisions, and administrative units as necessary. Existing units and their functions include: (1) Rivers and Lakes Commission; (2) Department of Public Works and Buildings, in charge of waterway improvements, canal, harbors, ports, etc.; and (3) Department of Public Works and Buildings, in charge of areas not otherwise transferred to another department. The Secretary of Transportation and the Director of Conservation are authorized to acquire by private purchase or by condemnation lands for which an appropriation may be made by the General Assembly. (See also W76-02081) (Parrish-Florida)
W76-02082

WATERWAYS, DRAINAGE, FLOOD CONTROL, WATER POLLUTION AND RESOURCES STUDY COMMISSION.
Ill Rev Stat, Chap 19, Par 145, 31-145, 34 (1973). 2 p.

Descriptors: *Illinois, *Administrative agencies, *Water management(Applied), *Governmental interrelations, *Planning, Water pollution, Drainage, Flood control, Water supply development, Costs, Water law, State governments, Administration, Coordination, Water resources development, Water resources.
Identifiers: *Waterways, *Commission.

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Act creates a commission to survey and study lems pertaining to waterways, drainage, flood rol, water pollution, and water resources, and ies its powers and duties. Commission mem- , who receive only their actual expenses, e two years. The commission is to study: (1) lems of the State in regard to waterways, r pollution and water resources,; (2) the inter- ionship of various state agencies concerned water resources and development; (3) the of administering water projects; (4) the rability and feasibility of the State establishing t-in-aid to political subdivisions for water pro- is; and (5) the water laws of Illinois. The Com- ion is to consult and cooperate with the nical Advisory Committee on Water ources in the course of such studies. (See also -02081) (Parrish-Florida)
-02083

AIN OF LAKES STUDY COMMISSION AND INOIS-MISSISSIPPI CANAL AND SINNIS- PI LAKE COMMISION CREATES-EFFEC- E DATE.
ub Act, 78-670, Sec 1-10 (1973), 2 p.

criptors: *Illinois, *Administrative agencies, gislation, *Water management(Applied), ter pollution control, Drainage, Flooding, als, Flood control, Costs, Recreation, Statue ernments, Administration, Planning, Coor- ation, Governmental interrelations, Water urces development.
ntifiers: *Chain of Lakes, *Illinois-Mississippi al.

s act creates two commissions, The Chain of es Study Commission and the Illinois-Missis- i Canal and Sinnissippi Lake Commission. It details their membership, and defines their ers and duties. The first commission is to ly and evaluate the Chain of Lakes area, com- ed of the lakes, the surrounding bays and chan- and adjoining land from the Illinois State line he locks at McHenry, and to make recommen- ons concerning the social, health and environ- ntal problems created by water use in the area. second commission is to continue consulta- with the appropriate State and Federal of- rs and private organizations concerning the abilitation of the canal. The act was to become ective July 1, 1973, and to be repealed as of July 974. (See also W76-02081) (Parrish-Florida)
6-02084

ICAGO REGIONAL PORT DISTRICT.
Rev Stat, Chap 19, Par 152-178, (1973), 3 p.

scriptors: *Port authorities, *Illinois, egislation, *Jurisdiction, *Administrative agen- s, State government, Federal government, nning, Coordination, Administration, Govern- ntal interrelations, Facilities, Real property, ps, Harbors, Construction.
ntifiers: *Chicago Regional Port District, Com- rcial facilities, Lake Columet.

e Chicago Regional Port District, enacted in 1, has as its duties the following: (1) to study existing harbor plans within the area of the rt District and to recommend change as neces- y; (2) to investigate conditions within the area, l to prepare and adopt a comprehensive plan for development of port facilities; (3) to study and ke recommendations for the improvement of minal facilities, and to promote commerce in Port area; (4) to recommend changes, as eded, in the jurisdiction of the port district; and to petition the appropriate governmental ad- nistrative authority for the adoption of any nge that would improve the handling of com- rce in the District. Any modifications in exist- harbor plans shall not reduce the total water a of Lake Calumet Harbor to less than 500 es. Finally if any provision of this Act is held alid, such invalidity does not effect any of its other provisions. (See also W76-02081) (Parrish-Florida)
W76-02085

FLOOD DAMAGE--CREATES ACT TO PREVENT.
Ill Pub Act 78-400, Sec 1-4 (1973), 1 p.

Descriptors: *Illinois, *Rainfall-runoff relationships, *Construction, *Retention, *Permits, Permeability, Municipal water, Rain, Rain water, Snow, Snow management, Snowmelt, Soils, Soil analysis, Soil moisture, Buildings, Building codes, Ponds, Planning, Runoff.

In order to minimize and prevent flood damage, this act authorizes Illinois counties and municipalities to adopt water runoff control requirements as part of the general building permit regulations. A suggested ordinance would require a building permit application be accompanied by a statement that the proposed construction includes facilities for orderly runoff or retention of rain and melting snow. In issuing the permit, factors such as soil permeability and adequacy of existing waterways would be considered. (See also W76-02081) (Parrish-Florida)
W76-02086

STUDY AND SURVEY OF LAKE MICHIGAN SHORELINE.
Ill Rev Stat, Chap 19, Par 1141-1146, (1973).

Descriptors: *Illinois, *Erosion, *Lake Michigan, *Shore protection, *Administrative agencies, Management, Planning, State governments, Federal government, Littoral drift, Littoral, Shores, Waves(Water), Structures, Currents(Water), Construction, Real property, Damages, Costs, Projects.
Identifiers: Great Lakes Naval Training Facility, Illinois Division of Water Resource Management.

This Act authorizes the Division of Water Resource Management to make studies and surveys of the shoreline of Lake Michigan. The main purpose of such studies is to devise means of preventing erosion of the shore by waves, currents, and natural and artificial structures, so as to prevent or minimize damage to homes and danger to human life. In this undertaking, the Division is authorized to cooperate with any agencies of the federal government it deems necessary. Furthermore, it is to work with the federal government in determining what influence the construction of the Great Lakes Naval Training Facility is having upon the southerly movement of littoral material along the west shore of Lake Michigan. (See also W76-02081) (Parrish-Florida)
W76-02087

ILLINOIS MUNICIPAL CODE (PROVISIONS RELATING TO MUNICIPAL JURISDICTION OVERWATERS AND WATERWAYS).
Ill Rev Stat, Chap 24, Par 7-4-4 thru 11-123-23, (1973), 12 p.

Descriptors: *Illinois, *Harbors, *Local governments, *Management, *Jurisdiction, Municipal water, State governments, United States, Administrative agencies, Flooding, Flood control, Canals, Canal construction, Channels, Channel improvement, Structures, Water purification, Boats, Legal aspects, Real property, Projects, Construction.
Identifiers: *Submerged lands.

The water law of Illinois relating to cities, villages and incorporated towns are herein revised and codified. Municipalities are given jurisdiction over all waters to the extent of three miles beyond the corporate limits, and are authorized to take appropriate actions regarding washing away of river banks, purification of waters, use of wharves and anchorage of boats. Corporate authorities may relocate channels, fill in water courses, and condemn property subject to certain restrictions. Any city or village bordering upon public waters has the right to construct and operate a harbor for the use of the public, with all rights of the State of Illinois, in and to submerged lands within and adjoining the harbor area, to be vested in the city or village. This means the harbors under this act are tax exempt. Furthermore, municipalities may: (1) occupy and reclaim submerged lands; (2) alter or construct channels and canals; (3) construct flood protection works; (4) contract with the United States in flood protection works; and (5) establish dock and harbor lines. All these powers are subject to the provisions of other acts, and are thus limited in varying degrees. (See also W76-02081) (Parrish-Florida)
W76-02088

COUNTIES (PROVISIONS OF ILLINOIS STATUTES RELATING TO COUNTY JURISDICTION OVER WATERS AND WATERWAYS).
Ill Rev Stat, Chap 34, Par 2-3, 430, 3101-3116 (1973) 3 p.

Descriptors: *Illinois, *Water supply, *Drainage, *Flood control, *Administrative agencies, Supervisory control(Power), Rivers, Navigation, Reclamation, Legislation, Wildlife, Fish, Waterusers, Water utilization, Planning, Federal government, Streams, Construction, Projects, Local governments, State governments, Water pollution control, Coordination, Water resources.

This Act authorizes those Illinois counties who adopt it to exercise all powers deemed necessary to control and alter waters within county boundaries. This includes reclamation and irrigation of land, filling up of watercourses, construction of dikes, dams, canals and reservoirs, and acquisition of real property by purchase, donation or condemnation. In addition, county boards are to supervise the flow of streams and rivers, and to cooperate as necessary with agencies of the United States in flood control and conservation projects. Pollution control also comes under the control of the county boards, although subject to the supervening authority of the State Pollution Control Board. (See also W76-02081) (Parrish-Florida)
W76-02089

SAFE DRINKING WATER ACT PL93-523--(LEGISLATIVE HISTORY).
For primary bibliographic entry see Field 5F.
W76-02090

THE ICELANDIC FISHERIES DISPUTE: A DECISION IS FINALLY RENDERED,
R. A. Briney.
Georgia Journal International and Comparative Law, Vol 5, p 248-256, 1975, 9 p, 59 ref.

Descriptors: *International Law, *Law of the Sea, *Jurisdiction, *Commercial fishing, *Boundary disputes, Foreign waters, International waters, Treaties legal aspects, Legal Review, Judicial decisions, Foreign countries, Fish management, Fish harvest, Water rights, Water law political aspects, Common law, Fish conservation, History.
Identifiers: *Iceland, Coastal zones, United Kingdom, Fishery resources, Coastal states.

The Icelandic Fisheries dispute came to a climax in 1971 when Iceland announced its intention to extend its fisheries jurisdiction to 50 miles. Following unsuccessful attempts to resolve the problem the United Kingdom took its case to the International Court of Justice. The United Kingdom sought resolution of the following issues: (1) that the claim by Iceland of entitlement to a zone of exclusive fisheries jurisdiction extending 50 miles is invalid; (2) that Iceland may not uni-

laterally assert such extended jurisdiction against the United Kingdom in violation of previous agreements between the two countries; and (3) that Iceland and the United Kingdom are under a duty to negotiate this problem in good faith. The Court's decision, however, did not answer the important question of whether the jurisdiction extension was legal. Basically the decision merely provides moral persuasion for the parties to continue negotiations. Future negotiations, the Court found, should take into account the following factors: Iceland's preferential rights based on its dependence on the area; the United Kingdom's historic right of access; the interests other states may have in these fisheries; andthe need to conserve the fishery resources involved. (Hoffman-Florida)
W76-02091

NONDEGRADATION OF WATER QUALITY: THE NEED FOR EFFECTIVE ACTION,
For primary bibliographic entry see Field 5G.
W76-02092

MAKING ENVIRONMENTAL LEGISLATION WORK,
Minnesota Mining and Mfg. Co., St. Paul.
J. T. Ling.
Federal Bar Journal, Vol 33, p 119-125, 1974, 7 p.

Descriptors: *Natural resources, Environmental effects, *Conservation, *Federal government, *Technology, Legal aspects, Legislation, Management, National Water Pollution Control Act, Natural resources, Water resources, Water pollution, Water pollution control, Water pollution abatement, Water quality, Water quality control, Energy, Resources development, Economics, Resource allocation, Environmental engineering, Air pollution.
Identifiers: *Environmental policy, FWPCA Amendments of 1972.

The current national policy of environmental protection expressed in legislation such as the federal Water Pollution Control Act is unrealistic in that it calls for the elimination of all pollution. Furthermore, it requires an inordinately large amount of natural and financial resources while ignoring other important environmental considerations. Pollution control should be but one beneficial result of a broader national goal: resource conservation. Resource conservation requires a total environment concept, including wise management of all available resources in the environmental system. Resource conservation also requires replacing the present consumption-oriented value system with a resource-oriented technology that will minimize the use of primary natural resources and maximize re-use of resources which have already been used or discarded. (Nursey-Florida)
W76-02093

FREEDOM OF SCIENTIFIC RESEARCH: STEPCHILE OF THE OCEANS,
Virginia Univ., Charlottsville. School of Law.
C. Maechling.
Virginia Journal of International Law, Vol 15, p 537-559, 1975, 23 p, 63 ref, 1 append.

Descriptors: *Research and Development, *Oceans, *International waters, *United Nations, *International law, Economics, Straits, Fisheries, Water pollution, Continental shelf, Research facilities, Resources development, Foreign research, Technology, Law of the Sea, Legal aspects, Treaties, Political aspects, Foreign countries, Jurisdiction.
Identifiers: Coastal states, *Law of the Sea Conference, Marine pollution, International disputes.

The Third United Nations Law of the Sea Conference did not reach the issue of freedom of scientific research in the oceans. It is the thesis of this article that the maritime powers have failed to accord protection of scientific research the high priority it deserves. A brief survey on the present status of the major issues at the Conference, the resolution of which directly affects scientific research, is presented to provide background on the Conference. These issues include the extent of territorial seas, control of straits and archipelagoes, determinating economic zones, protection of fisheries, and prevention of marine pollution. As things now stand, scientific research is subject to the arbitrary control of coastal states in their territorial seas, and to regulation by international agreement on or over the continental shelf. It remains unrestricted on the high seas but with the area of coastal state control steadily expanding the crucial question is whether the claim of scientific research to protected status will survive, or whether coastal state assertions of sovereignty will culminate in an agreement giving international sanction to encroachments and subsequent restrictions on the high seas. (Hoffman-Florida)
W76-02094

NO WAIVER OF SOVEREIGN IMMUNITY 'IMPLIED FROM STATES' ENTRANCE INTO A FEDERALLY REGULATED AREA UNLESS THERE EXISTS AN EXPRESS PRIVATE RIGHT OF ACTION AGAINST THE STATE,
A. A. De Sabato.
Villanova Law Rev, Vol 20, p 201-213, 1974-75, 13 p, 79 ref.

Descriptors: *Constitutional law, *Navigable waters, *Bridge failure, *Georgia, *Judicial decisions, Water law, Federal jurisdiction, State jurisdiction, Penalties(Legal), Barges, Damages, Navigation, Channels, Jurisdiction, Ships, Bridges, Costs, Legal aspects.
Identifiers: Sovereign immunity, Tort liability.

A privately owned tugboat and barge, laden with heavy cargo, were unable to pass beneath a drawbridge on the Flint River in Georgia. The bridge could not be raised because it had not been paved over by the state. The owner of the barge brought suit against the state of Georgia alleging that the delay in delivery of the cargo resulting from the negligent operation of the drawbridge had caused it considerable monetary damage. Georgia moved to dismiss the suit on grounds of sovereign immunity under the eleventh amendment of the United States Constitution. The barge owner contended that since the bridge was built on a navigable waterway and was therefore subject to the Bridge Act of 1906, the state had waived the sovereign immunity defense by entering a federally regulated sphere of activity. The district court agreed and denied the motion to dismiss. On appeal, the Fifth Circuit reversed, holding the state entrance into a federally regulated sphere did not constitute a waiver of sovereign immunity unless Congress had provided a private cause of action for violation of the applicable regulatory statue and made it applicable to the states. (Hoffman-Florida)
W76-02095

AIR AND WATER QUALITY STANDARDS IN FLORIDA,
Florida State Dept. of Environmental Regulation, Tallahassee.
For primary bibliographic entry see Field 5G.
W76-02096

NATIONAL WILD AND SCENIC RIVERS SYSTEMS, P.L. 93-279--LEGISLATIVE HISTORY.
U.S. Code Cong. and Admin. News, p 3006-3020, 1974, 15 p.

Descriptors: *Wild Rivers Act, *Wild rivers, *Recreation, *Scenery, *Legislation, Aesthetics, Conservation, Natural resources, Water sports, Multi-purpose projects, Land use, Social impact, Water policy, Balance of nature, Ecology, Environmental effects, Comprehensive planni
Aquatic habitats, Wildlife conservation, Alter
tive water use, Water resource developme
North Carolina, South Carolina, Georgia
Identifiers: *Chattooga River, Wild and Sce
Rivers System

The purpose of this legislation is to include
Chattooga River in the Wild and Scenic Riv
System and to make various general amendme
to the Wild and Scenic Rivers Act. The Chattoo
River runs through North Carolina and So
Carolina before it empties into Lake Tugaloo
Georgia. Sections of the rivers included in
Wild and Scenic Rivers System are generally cl
sified in three categories--wild, scenic, or recre
tional--depending upon the nature of each sectio
the amount and type of access to it, the charac
of the area surrounding it, and the degree
development along the shoreline. The Chattoo
River will include 40.3 miles classified as wild; 6
miles classified as scenic; and 10.1 miles classifi
as recreational. The Committee on Interior and
sular Affairs recommends the Chattooga be
cluded in the System in order to preserve its ecol
gy and the beauty of the river and its environs. T
Committee notes that few alternative uses of t
area, such as harvest of timber sources a
hydroelectric power production, are economical
feasible. Also presented are general amendmen
to the Act proposed to remedy deficiencies whi
have surfaced during the past five yea
(Hoffman-Florida)
W76-02097

RESERVING CERTAIN SUBMERGED LANDS PRESIDENTIAL PROCLAMATION NO 4347.
U.S. Code Cong and Admin News, p 52-53, 1975,
p.

Descriptors: Beds, *Ownerships of beds, *Feder
jurisdiction, *Virgin Islands, Atolls, Turtle
Aquatic habitats, Aquatic environment, Aquati
life, United States, Environmental effects, Marin
animals, Submergence, Administrative decision
Transfer, Jurisdiction, Wildlife habitat, Wildlife.
Identifiers: Administrative jurisdiction, *Guam
*American Samoa, National defense.

The submerged lands surrounding the Rose Ato
National Wildlife Refuge in American Samoa ar
necessary for the protection of the atoll's marin
life, especially the green sea and hawksbill turtles
The submerged lands in Apra Harbor and thos
adjacent to Inapsan Beach and Urano Point i
Guam, and certain submerged lands on the wes
coast of St. Croix, United States Virgin Islands
are required for national defense purposes. Fo
these reasons Gerald Ford, President of th
United States, proclaimed that these lands are ex
cepted from the transfer to the Government o
American Samoa, the Government of Guam an
the Government of the United States Virgi
Islands under Section 1(a) of Public Law 93-435. A
description of the land involved is presented. The
submerged land in American Samoa will now be
under the joint administrative jurisdiction of the
Department of Commerce and the Department of
the Interior, while all of the excepted land within
the territories of Guam and the Virgin Islands will
be under the administrative jurisdiction of the De-
partment of the Navy. (Hoffman-Florida)
W76-02098

DISPOSAL OF DREDGED MATERIAL IN NAVIGABLE OR OCEAN WATERS.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 5E.
W76-02099

ALABAMA; NAVIGABEL WATERS (PROPOSED WATER QUALITY STANDARDS).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-02100

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TAL ZONE MANAGEMENT PROGRAM OVAL REGULATIONS.
al Oceanic and Atmosphere Administra- ockville.
l Register, Vol 39, No 163, p 30153-30164, t 21, 1974, 12 p.

ptors: *Adoption of practices, *State nments, Planning, *Coastal plains, ronmental control, Coasts, Environmental s, Legislation, Administrative agencies, l government, Industrial wastes, Industries, Ecosystems, Resource allocation, Manage- Land use, Water users, Water quality con-

fiers: *Environmental impact statement, tal Zone ManagemenA act.

rth in this document are guidelines proposed e National Oceanic and Atmospheric Ad- ration pursuant to section 306 of the Coastal Management Act for reviewing state pro- . The guidelines provide that statement of issues and policies shall accompany any sed program in order to assure that it is con- t with national policies expressed in the Act. nvironmental impact statement is also ed. If the proposals are adopted the coastal will henceforth include only those land e development will have a direct impact on l waters. Identification of permissible land vater uses which have such an impact on al waters shall include an inventory of natural nan-made coastal resources, an analysis of apabilities of each resource, and a report of ojected impact of each use upon the natural onment. To assist states in assuring that pro- s for siting facilities which serve other than needs also comply with national guidelines, a such facilities is set forth. As for other state ams, procedural and organizational means plementing them must be established before approval is granted, along with evidence that have been formally adopted in accordance state law. Guidelines for public hearings, gu- torial review, and approval and applicability and water pollution control requirements are ded. The final set of guidelines deals with ap- tion procedures for administrative grants to sed in conjunction with the Grants Manage- Manual under the Act. (Jenkins-Florida) 02101

DELINES FOR REVIEW OF FISH AND DLIFE ASPECTS OF PROPOSALS IN OR ECTING NAVIGABLE WATERS.
and Wildlife Service, Washington, D.C.
ral Register, Vol 39, No 159, p 29551-29565, ust 15, 1974, 15 p.

riptors: *Adoption of practices, ninistrative agencies, *Environmental ef- , *Permits, *Wildlife conservation, Fish con- ation, Ecosystems, Inter-agency cooperation, ning, Drainage programs, Navigable waters, ral government, Legislation, Pollution abate- , Ports, Structures, Water manage- (Applied), Navigation.
tifiers: Guidelines(Administrative), vironmental impact statement.

tive guidelines are proposed in handbook by the Director of the Fish and Wildlife Ser- to assist service employees in reviewing osals for federal activities to be conducted in gable waters. The central focus is on the gation permit program of the Corps of En- ers for dredge and fill activities. The handbook vided into six sections, the first of which sum- zes and categorizes federal activities requiring ous agency permits. Section Two presents an rview of the policies of the Service relating to e activities. The procedure for preliminary ening of proposals is prescribed in Section ee, while elements of field studies used in rmining the impact of a proposal on fish and life are set forth in Section Four. Specific pol- icy guidelines for review of proposals for categories of docks and piers, marinas and port facilities, cables, jetties, lagoons, and other structures appear in section five. The last section provides guidelines for coordination with other agencies. Procedures for service reports and environmental impact statements conclude the handbook. (Jenkins-Florida)
W76-02102

PHOSPHATE MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-02103

PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-02104

WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES, VOL I,
W. A. Hutchins.
U.S. Dept of Agriculture, Miscellaneous Pub No 1206, Vol 1, 1971, 650 p. Completed by H. H. Ellis and J. P. DeBraal.

Descriptors: *Diversion, *Usufractuary right, *Appropriation, *Beneficial use, *Prescriptive rights, Riparian rights, History, Arid lands, Preferences(Water rights), Navigable waters, Legal aspects, Judicial decisions, Priorities, Water utilization, State governments, Federal government, Irrigation, Permits, Administrative agencies, Water users, Water allocation(Policy), Pacific Coast Region, Real property, Water.
Identifiers: *Western States.

The arid conditions prevailing in most of the Western states have led to modification and, in some cases, repudiation of the riparian water rights doctrine of the humid East. In its place, an alternative body of water law has arisen based upon appropriation of water for beneficial use. This book is a comparative analysis of the development and status of the constitutional provisions, statutes, court decisions, and administrative policies regarding water law rights in the nineteen western states, including Alaska and Hawaii. The analysis includes the nature of such rights, their acquisition, control, exercise, transfer, protection and loss. Historical origins, interstate conflicts, and Federal influences are also examined. Volume One concentrates on (1) types and characteristics of watercourses, (2) the property nature of water and water rights, (3) water rights systems, and (4) the nature, acquisition and exercise of the appropriative right. (Parrish-Florida)
W76-02105

CENTRAL COLORADO WATER CONSERVANCY DISTRICT V. COLORADO RIVER WATER CONSERVATION DISTRICT (CANCELLATION OF CONDITIONAL DECREE WHEN DISTRICT REFUSED TO COMPLY WITH FACILITY CONSTRUCTION STATUTE).
526 P2d 302-04 (Colorado 1974), 3 p.

Descriptors: *Colorado River Basin, *Appropriation, *Water allocation(Policy), *Constitutional law, Preferences(Water rights), Water law, Judicial decisions, Legal review, State jurisdiction, Colorado, Colorado River, Legislation, Legal aspects, Public rights, Water conservation, Water policy, Water supply, Water management(Applied), Rationing(Water), River basin development.
Identifiers: *Statutory requirements.

Plaintiff, a statutorily created water conservancy district, had filed an application for the right to appropriate water from the Colorado river basin. Despite opposition from several governmental units, the trial court conditionally approved the application, provided that the plaintiff satisfied prescribed statutory requirements. Those requirements, which were part of the statutory scheme authorizing creation of the plaintiff, provided that facilities needed to transport the appropriated water could be constructed and operated only if no damage was caused to water users within the basin. Plaintiff, contending the requirements were unconstitutional, appealed. The Colorado Supreme Court, sitting en banc, affirmed the decision, holding that a governmental entity created by a statute cannot attack that same statute. Furthermore, the right to appropriate state waters belongs to the people. Thus, the legislature may condition the granting of appropriation rights upon the satisfaction of prescribed requirements. (Hoffman-Florida)
W76-02106

WATCHORN BASIN ASSOCIATION V. OKLAHOMA GAS AND ELECTRIC COMPANY (ELECTRIC COMPANY'S ACQUISTION OF LAND NOT A PRE-REQUISITE FOR WATER APPLICATION TO WATER RESOURCES BOARD).
525 P2d 1357-59 (Oklahoma, 1974), 3 p.

Descriptors: *Oklahoma, *Appropriation, *Condemnation, *Electric power plants, *Diversion, Administrative decisions, Judicial decisions, Legal review, Administration, Water law, Land use, Land development, Utilities, Legal aspects, Streams, Eminent domain, Water permits.

Respondent utility company filed an application with the Water Resources Board seeking authority to appropriate creek water, which would be used by its new generating station. The company had already acquired part of the land necessary for this project and was attempting to acquire the remaining land needed, including petitioners' land. To prevent construction of the generating station, petitioners sought a writ of prohibition from the Oklahoma Supreme Court to prohibit the Board from considering the utility company's application. Petitioners contended that the company did not have the authority to condemn their land, and that the Board could not consider the application until all of the land needed for the project was acquired. The Supreme Court rejected this argument, however, denying the writ and holding that the acquisition of all necessary land was not a prerequisite to Board consideration of the application. The Court did not decide the issue of whether respondents could condemn the petitioners' land. (Hoffman-Florida)
W76-02107

TALBOT V. GRAY (LAKESIDE DOCK A PERMITTED ACCESSORY USE WITHIN ZONING ORDINANCE).
525 P2d 801-804 (Wash Ct App, 1974), 4 p, 1 map.

Descriptors: *Washington, *Adjacent landowners, *Zoning, *Docks, *Construction, Permits, Shores, Legal aspects, Regulation, Land use, Lakes, Legislation, Penalties(Legal), Judicial decisions, Legal review, Land use.
Identifiers: *Notice requirements.

Plaintiff landowners had brought suit to enjoin defendant adjoining landowners from constructing a dock on the shoreland of a lake. Plaintiffs contended that the permit issued to defendants by the city was invalid since the local zoning ordinance prohibited the construction. The trial court rejected this contention, however, denying injunctive relief, and awarding damages to the defendants for legal expenses incurred defending the action. On appeal, plaintiffs once again contended

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that the zoning ordinance had been improperly interpreted. They also reiterated their contention that defendants had not given adequate notice of the construction as required by the state Shoreline Management Act of 1971, which has been implemented by a local ordinance. In affirming the court held that since defendant's notice satisfied the requirements of the Act, it was irrelevant that it did not satisfy the ordinance requirements (Hoffman-Florida)
W76-02108

DAYLEY V. CITY OF BURLEY (NOT PERMISSIBLE TO DIVERT CITY STORM WATERS INTO CREEK WHICH WAS NOT A NATURAL WATER COURSE).
524 P2d 1073-77 (Idaho 1974), 5 p.

Descriptors: *Idaho, *Riparian rights, *Watercourses(Legals aspects), *Surface waters, *Streams, Cities, City planning, Drainage systems, Drainage effects, Sewers, Stormwater, Right-of-Way, Public rights, Legal aspects, Diversion, Runoff, Judicial decisions.
Identifiers: Injunctive relief, Nuisance, Sovereign immunity.

Plaintiff landowner brough an action to enjoin defendant city from diverting water from city's storm system into a creek which transversed plaintiff's property. The city contended it was merely channelling surface water into the storm system. It also contended that it was an upper landowner with a servitude over lower lands to discharge water into natural water courses. In affirming the lower court's decision to enjoin the city from diverting storm waters into the creek, the Supreme Court of Idaho noted that the water course in question was actually a creek bed that had not carried water since the upper creek has been dammed, in 1921, and that portions of the creek bed had been altered or eliminated. Thus, while recognizing that a natural servitude of drainage may exist between enjoining lands, the court held the city has no prescriptive right to discharge water into what is no longer a natural water course. (Gray-Florida)
W76-02109

FULLENWIDER V. BAGWELL (WIDE COURT DISCRETION IN SHAPING INJUNCTIVE RELIEF FOR PLAINTIFF'S UNCONTESTED WATER RIGHT).
524 P2d 619-22 (Colorado Court of Appeals, 1974), 4 p.

Descriptors: *Colorado, *Legal review, *Beavers, *Dams, *Riparian rights, Riparian water loss, State governments, State jurisdiction, Trapping, Administrative agencies, Adjacent landowners, Court decisions, Judicial decisions, Watercourses(Legal aspects), Streams, Streamflow, Irrigation, Irrigation water.
Identifiers: *Injunctive relief, *Standing(Legal).

Plaintiff landowners brought action to amend a judgement entered in their favor in an earlier suit where they had sought permission to enter defendant's land for the purpose of removing beaver dams obstructing streams from which plaintiff derived irrigation water. The original judgement denied plaintiff acess to the land, ordering instead the state game and fish commission to trap and relocate the beavers. Plaintiffs contended the efforts of the game commission were unsuccessful and insufficient, and requested additional methods to remove the nuisance. Affirming the lower court's refusal to amend the original order, the Colorado Court of Appeals noted that the evidence before the court clearly supported the feasibility of removing the beavers by live trapping. The court also held that, although the plaintiff had an uncontested water right, the court can exercise wide discretion in shaping injunctive relief, including invoking the services of a state agency not a party to the original action. (Gray-Florida)
W76-02110

AVONDALE IRRIGATION DISTRICT V. NORTH IDAHO PROPERTIES, INCORPORATED (REQUIREMENT OF UNITED STATES TO QUANTIFY WATER RIGHTS FOR STATE COURT ADJUDICATION UNDER MCCARRAN AMENDMENT).
523 P2d 818-22 (Idaho 1974), 5 p.

Descriptors: *Idaho, *Reservation doctrine, *State jurisdiction, *Federal-state water rights conflicts, *Water requirements, Water rights, National parks, Legal aspects, Water law, Projections, State governments, Use rates, United States, Rates, Federal jurisdiction.
Identifiers: *Notice, *Sovereign immunity, Congressional hearings, Water rights(Non-riparian).

Plaintiffs, three Idaho irrigation districts, brought action to adjudicate water rights to Hayden Lake and its tributaries. The United States intervened, claiming water rights based upon the reservation doctrine. Subsequently, the Idaho State Department of Water Administration intervened to deny the United States' claim. The district court held that the United States must quantify its reserved water rights. The Supreme Court of Idaho affirmed, noting that, although the existence of federal reserved water rights is well established, there is inconclusive case law as to whether such rights must be quantified. The court first said that the question of reserved rights is within the purview of 43 U.S.C. S666, generally known as the McCarren Amendment. Furthermore, the court held that the statute's intent is to instill certainty into any adjudication of water rights. In order to assure such certainty, the United States in this case is bound by state law, and reserved water rights must be quantified prior to the time of final adjudication. (Gray-Florida)
W76-02111

FARMERS INVESTMENT COMPANY V. PIMA MINING COMPANY (SALE OF WATER FROM CRITICAL GROUNDWATER AREA IMPROPER UNLESS AT AUCTION TO HIGHEST BIDDER).
523 P2d 487-90 (Arizona 1974), 4 p.

Descriptors: *Arizona, *Groundwater, *Leases, *Adjacent landowners, Legal aspects, Legal review, Natural resources, Land, Administration, Contracts, Judicial decisions, Water policy, Water law, Water allocation, Water conservation, Equitable apportionment, Water consumption(Except consumptive use).

Respondent mining company acquired a 10-year lease within a critical groundwater area from the State Land Department of Arizona. Under the terms of the lease, the respondent could remove as much water as it needed for a $10 yearly charge. Petitioner farming company, owner of many acres within the same groundwater area, brought this action to have respondent's lease declared void. Petitioner contended that the water was a product of the land and thus, under applicable state law, had to be sold at a public auction to the highest bidder. The trial court rejected this contention, however, and granted respondent's motion for summary judgement, holding that the lease in question was of a commercial nature and thus exempt from the statute. On appeal, the Arizona Supreme Court reversed, holding that the lease was null and void. The Court found that the character of a contract is determined by its provisions rather than its label. In this case, even though the lessee was commercial, the Court found that the lease was in reality a sale of water from the state to respondent. Consequently, for such a lease to be valid, it would have to be acquired by the highest bidder at a public auction. (Hoffman-Florida)
W76-02112

MORALES V. WESTERGARD (CALIFORNIA NEVADA INTERSTATE COMPACT AND LAKE TAHOE CONDOMINIUMS)
522 P2d 1224-25 (Nevada, 1974), 1 p.

Descriptors: *Nevada, *Water supply, *Sewage treatment, *Administrative decisions, Administrative agencies, Basins, Water supply development, Water conservation, Administrative decisions, Water management(Applied), Water resources, Water table, Judicial decisions, Legal review, Legal aspects, Gravitational water.
Identifiers: Closed sewer systems.

Petitioner developers attempted to get their condominium map, which described their development's sewage and water supply systems, approved by the Bureau of Environmental Health. The Bureau refused to give its approval, however, finding that the development's use of water from the Lake Tahoe basin would violate the California-Nevada Interstate Compact. As a result of the decision, petitioner sought a writ of mandamus from the Supreme Court of Nevada to compel the Bureau to approve the condominium map. The Court granted the relief sought, finding that the development's proposed use of water would not violate the Interstate Compact. The Court noted that water taken by the development from the Lake Tahoe basin would be returned, except for a minimal amount which would be used for lawn care, to the basin by natural gravity through the closed sewer system. Therefore, the Compact's aim of controlling and conserving water use within the basin would not be violated by the approval of the condominium map. (Hoffman-Florida)
W76-02113

CITY OF ROSWELL V. REYNOLDS (CITY'S CHANGING POINTS OF APPROPRIATION FROM UNDERGROUND WATER BASIN NOT AN IMPAIRMENT OF OTHER USERS' RIGHTS).
522 P2d 796-802 (N.M. 1974), 7 p, 2 tab.

Descriptors: *New Mexico, *Prior appropriation, *Municipal water, *Administrative decisions, *Preferences(Water rights), Regulation, Administration, Judicial decisions, Legal review, Legal aspects, Competing uses, Saline water, Equitable apportionment, Water law, Water allocation(Policy), Water utilization, Basins, Rationing(Water), Water demand.
Identifiers: Appropriation points.

Appellant city sought authorization from the State Engineer to change appropriation points of a specified amount of water from an underground water basin. The State Engineer granted the request, provided that the city would reduce the quantity and rate of pumpage from the new appropriation points. This reduction was deemed necessary, to protect the rights of existing users and to keep the salinity level of waters under the new appropriation points at an acceptable level. After district court affirmance of this decision, the city appealed to the Supreme Court of New Mexico. The Court, after a detailed review of the facts, found that the State Engineer's decision requiring usage reduction was supported by substantial evidence. Consequently, the burden was upon the city to prove that the impairments foreseen by the Engineer would not occur. When the city failed to meet his burden, the Court affirmed the Engineer's decision. (Hoffman-Florida)
W76-02114

WHEATLAND IRRIGATION DISTRICT V. TWO BAR-MULESHOE WATER COMPANY (DETERMINATION OF IRRIGATION DITCH CAPACITY TO COMPLY WITH SEASONAL LEASE).
521 P2d 1334-38 (Wyoming 1974), 5 p.

Descriptors: *Wyoming, *Irrigation ditches, *Water rights, *Flow rates, *Water contracts,

r conveyance, Contracts, Water, Water law, l aspects, Irrigation, Irrigation districts, ies, Water transfer, Irrigation engineering, , Flow measurement, Flow characteristics.
ifiers: Specific performance, Irrigation n.

tiff water company successfully brought suit st defendant irrigation district for specific rmance of an agreement to furnish irrigation r. Plaintiff's predecessor had entered into a in which it granted defendant's predecessor ight to use certain lands as a reservoir site, in n for the right to use such quantity of water as l be carried through two specific irrigation es during the irrigation season of each and y year. In modifying the trial court's findings ct as to the carrying capacity of the ditches in tion, the Supreme Court of Wyoming applied ule that a ditch will carry only that quantity of r than will pass the point of least capacity. the flow rate for the point of least capacity, r than an average rate, should be applied in rmining the quantity of water the parties in- ed to be furnished under the agreement. The t held further that the term 'irrigation season' nt that period of time in each growing season ng which water was needed for the types of s grown by plaintiff lessor, whether or not irrigation season coincided with that of de- ant lessee. (Schilling-Florida)
-02115

NINGS V. WALSH (NO SEWER SERVICE ARGE TO HOMEOWNERS WITH SEPTIC NKS EVEN THOUGH SEPTIC TANK'S CON- NTS PLACED EVENTUALLY IN SEWER OF NICIPALITY).
P2d 311-14 (Kansas 1974), 4 p.

criptors: *Kansas, *Sewerage, *Rates, *Septic ks, *Public utilities, Local governments, State ernments, Water, Water law, Legal aspects, er pollution, Sewage disposal, Wastes, Waste osal, Sewage, Sewage disposal, Taxes, Costs.
ntifiers: *Kansas Water Pollution Act, Injunc- relief.

ntiffs, owners and occupiers of homes which e not connected to the municipal sewage tem, brought suit against defendant municipali- seeking declaratory and injunctive relief with ject to the levying of a sewer service charge by municipality. The charge in question was as- sed under a city ordinance providing that per- s using private septic or disposal tanks in the were subject to such a charge. Defendant ar- d that the ordinance was proper under the Kan- Water Pollution Act and other statutory hority. The Supreme Court of Kansas dis- eed, noting that the Act provided for charges ed on the strength and volume of sewage con- uted. and that plaintiffs in fact contributed no vage to the city system. Morever, the other tutes cited by defendant followed the general that sewage charges be keyed to use of the tem. Such fees are considered for services dered rather than a tax. Thus the court held t, under the circumstances, the levying of a vage charge was not authorized by any of the tutes in question, and affirmed a judgement for intiffs. (Schilling-Florida)
6-02116

UEGMAN V. JOHNSON RANCHES, INC. BANDONMENT OF WATER RIGHTS AND E CAREY ACT).
P2d 489-91 (Wyoming 1974), 3 p.

scriptors: *Wyoming, *Water rights, ontracts, *Administrative agencies, ppropriation, Water, Water law, Legal aspects, nstitutional law, Irrigation, Irrigated land, Ir- ation water, Permits, Water utilization.
ntifiers: *Carey Act, Abandonment.

Appellee landowner filed petitions for declarations of abandonment of certain water rights of appellant landowners based on grounds of non-use. The State Board of Control granted the petitions, and the district court affirmed. Appellants' predecessors had acquired the lands to which the water rights in question applied through operation of the Carey Act. Appellants' predecessors had entered into a contract with appellee's predecessors, under which they were to acquire the means to irrigate their lands. Permits to appropriate water has been issued by the state. Appellants' sole argument on appeal was that the Board of Control had no power to determine the abandonment issue since the water rights in question arose through a contract. The Supreme Court of Wyoming disagreed, holding that although appellants' land had been acquired under the Carey Act, the water rights in question had been obtained in the usual fashion and thus were no different than other water rights. Under the Wyoming Constitution, the waters in question were the property of the State, and were, therefore, subject to appropriation and abandonment. (Schilling-Florida)
W76-02117

CHEROKEE WATER DISTRICT V. COLORADO SPRINGS (SUPPLYING WATER (TO A CITY) OUTSIDE THE WATER DISTRICT).
519 P2d 339-41 (Colo 1974), 3 p.

Descriptors: *Water supply development, *Municipal water, *Colorado, *Water districts, *Supply contracts, Legal review, Judicial decisions, Water allocation(Policy), Water rights, Economics, Water utilization, Water users, Proprietary power, Rates, Municipal water, Water supply.
Identifiers: *Governmental capacity.

Plaintiff water district contracted with defendant city, which was located outside of the district, to provide water for a 10 year period at a fixed rate. The contract also gave the city an option in pertetuity to receive a specified amount of water yearly after the original contract expired. Six years later the water district, which wanted to raise the city's rate, sought a declaration that portions of the contract were void. The water district contended that a new statute giving districts the power to increase water charges authorized it to raise its rates regardless of the contract. It also contended that the option in perpetuity was void as against public policy. The trial court rejected both contentions, finding that the entire contract was valid and enforceable. On appeal, the Colorado Supreme Court affirmed, finding that the statute gave water districts the right to increase to customers within its district. As to customers outside of the district, however, the statute was found to be inapplicable, because the water district was acting in a proprietary rather than a governmental capacity. Thus, the contract with the city was valid. Furthermore, the Court held options in perpetuity in was use contracts not to be against public policy. (Hoffman-Florida)
W76-02118

LEMMON V. HARDY (VALID TO INITIATE WATER RIGHT ON UNSURVEYED PUBLIC DOMAIN BUT NOT ON PRIVATE PROPERTY).
519 P2d 1168-71 (Idaho 1974), 4 p.

Descriptors: *Idaho, *Water rights, *Application methods, *Trespass, *Water policy, Water, Water law, Legal aspects, State governments, Administrative agencies, Relative rights, Permits, Water permits, Water allocation(Policy), Adjudication procedure, Fisheries, Public lands, Real property.
Identifiers: Speculative interests.

Appellants, filers of first application for a water permit, appealed a district court judgement affirming an administrative decision that filers of second application had priority. At the time of their original application, appellants had no interest in any part of the lands on which they proposed to use the waters in question. Subsequent to appellants' application, appellers were declared the successful bidders on the same property which appellants had claimed as a leasehold in their application. Appellants later filed an amended application which changed the place of use of the water. The Supreme Court of Idaho applied the rule that, while a water right initiated on the unsurveyed public domain is valid, a water right initiated by trespass on private property is invalid. Since appellants could develop no valid water rights in private property in which they had no possessory interest, the court held that the filing of their initial application constituted speculation in and of itself and that appellants could not file an application for a water right and then seek a place on which to exercise it. The court, therefore, affirmed the previous decision granting priority to appellees. (Schilling-Florida)
W76-02119

THOMPSON V. HARVEY (NO RIGHT BY OWNERS OF FOURTH PRIORITY WATER RIGHT TO DIVERT CREEK IF DAMAGE TO OTHERS).
519 P2d 963-66 (Montana 1974), 4 p.

Descriptors: *Montana, *Riparian rights, *Water transfer, *Riparian waters, *Appropriation, State governments, Water, Water law, Legal aspects, Water rights, Canals, Diversion, Water policy, Alteration of flow, Water use, Relative rights, Judicial decisions.

Petitioner water rights owners appealed a district court judgement denying a petition for an order authorizing a change in point of diversion on Deep Creek, from a point below the intersection of a canal to a point above such intersection. The petition was protested by owners of water rights subordinate to the petitioners', most of whom were also purchasers of water from the canal. Under Montana law, petitioners were precluded from making the change sought if injury to others was shown to be the result of such change. Petitioners did not deny that the protesters would be injured as a result of the desired change, but contended that the protesters did not have status to object to the change because of their 'unclean hands' and misuse of the creek channel. This argument was based on protesters' practice of removing creek water at points above the canal intersection and replacing such water with canal water. However, the Supreme Court of Montana found the protesters' practice as affirmatively sanctioned by Montana statute. The court, therefore, held that their acts did not bar them from objecting to the proposed change, and affirmed the judgement of the lower court. (Schilling-Florida)
W76-02120

G AND A CONTRACTORS, INC. V. ALASKA GREENHOUSES, INC. (SILTATION OF CREEK CONTINUING TRESPASS REQUIRING RESTORATION MEASURE OF DAMAGES).
517 P2d 1379-88 (Alaska, 1974). 10 p, 1 append.

Descriptors: *Alaska, *Adjacent landowners, *Damages, *Sediment load, *Reasonable use, Sediment control, Judicial decisions, Legal review, Competing uses, Legal aspects, Obstruction of flow, Natural flow doctrine, Relative rights, Construction equipment, Streamflow, Diversion, Alteration of flow, Penalties(Legal).
Identifiers: *Rerouted streams, Ground cover.

Plaintiff greenhouse operator had purchased a large tract of land traversed by a creek. Plaintiff had hoped to use this creek as the focus of a garden showplace and recreation area. When extensive damage was caused to the ground cover and trees along the creek by earthmoving equipment hired by defendant adjoining landowner to reroute the creek on defendant's land, plaintiff

brought suit seeking damages and an injunction to prevent future siltation of the creek. After the trial court had granted the relief sought, defendants appealed, contending that reasonable use of the land included siltation, and that even if damages were proper, the measure of such damages should be the reduction in land value rather than the cost of restoration. In affirming the lower court's judgement, the Alaska Supreme Court held that defendant's use of the land was unreasonable. Furthermore, the Court held that the cost of restoration was the proper measure of damages. (Hoffman-Florida)
W76-02121

SHRULL V. RAPASARDI (RIGHTS OF OWNER AS TO DITCH EXCAVATED OVER ANOTHER'S PRIVATE LANDS).
517 P2d 860-62 (Colo Ct App 1973), 2 p.

Descriptors: *Easements, *Colorado, *Adjacent landowners, *Trespass, *Ditches, Damages, Excavation, Legal review, Judicial decisions, Legal aspects, Law enforcement, Surface runoff, Real property, Water courses(Legal aspects), Drainage systems, Land use.
Identifiers: *Servient land, *Dominant land.

Defendant ranch owners had entered plaintiff's adjoining ranch to open a ditch. Drainage water from plaintiff's property which was intercepted by this ditch was used to irrigate the defendant's land. Seven years after this initial excavation, defendants entered plaintiff's property to reopen the ditch which had become clogged. Following this incident, plaintiff brought suit seeking damages for trespass. At trial, defendants contended that they had acquired an easement across plaintiff's land since the initial excavation of the ditch had been done with plaintiff's knowledge. The trial court agreed and dismissed the complaint. On appeal, plaintiff reiterated his contention that no easement had been granted, and that even if one had been granted, it did not authorize defendants to enter plaintiff's land to reopen the ditch. The court affirmed, however, finding that once the easement for the ditch had been granted, the owner of the servient land could not later deny defendants the right to maintain the ditch. (Hoffman-Florida)
W76-02122

JEWELL V. KROO (REPLACEMENT OF DAM RIGHT OF OWNERS OF WATER EASEMENT WHERE LARGER RESERVOIR REQUIRED).
517 P2d 657-60 (Oregon 1973), 3 p.

Descriptors: *Oregon, *Easements, *Dams, *Damages, *Adjacent landowners, Water requirements, Water rates, Water shortages, Dam design, Dam construction, Damsites, Springs, Spring waters, Natural flow, Legal aspects, Legal review, Judicial decisions, Water users.
Identifiers: *Injunctive relief, Nuisance.

Plaintiff landowners, upon whose property a spring was located, brought action for damages to a rock and earthen dam located on their property. Plaintiffs contended defendants, adjacent landowners, had come onto their property and destroyed the dam. Defendants sought to enjoin plaintiffs from interfering with construction of a concrete dam designed to replace the previous structure. Defendants contended that ownership of an easement for 500 gallons of water per day, coupled with the inability of the original dam to impound a sufficient quantity of water, authorized self-help measures. In affirming the lower court's denial of plaintiffs' request for damages, the Supreme Court of Oregon noted that the owner of a dominant estate may enter a servient estate for the purpose of doing anything reasonably planned to protect his easement. The court noted that where lawful demands for water require the alteration of a reservoir, and the changes made are necessary to meet such demands, self-help is a proper course of action. (Gray-Florida)
W76-02123

GALLUP GAMERCO COAL COMPANY V. IRWIN (APPLICATION OF DOCTRINES RELATING TO OIL AND GAS LEASES TO THE LEASE OF WATER WELL).
515 P2d 1277-81 (New Mexico 1973), 5 p.

Descriptors: *New Mexico, *Wells, *Well casings, *Leases, *Contracts, Maintenance costs, Equipment, Replacement costs, Corrosion, Pipes, Water wells, Well data, Oil wells, Gas wells, Oil industry, Judicial decisions, Contract administration, Municipal water, Water demand.
Identifiers: *Proximate cause, *Injunctive relief.

Plaintiff, lessor of a water well, brought action to recover damages for lessee's failure to supply lessor with an adequate amount of water. Plaintiff also contended lessee had failed to maintain and repair the well as agreed. Defendant city contended its obligations to repair the well did not arise until the expiration of the lease period, thereby precluding plaintiff from having a cause of action prior to the expiration of the lease period. In affirming the lower court's decision to grant plaintiff damages for lessee's failure to supply adequate water to lessor, the Supreme Court of New Mexico moted that the terms of the lease were similar to terms of oil and gas leases, and are therefore to be interpreted by using oil and gas doctrines. In reversing that part of the lower court's decision denying damages for lessee's failure to maintain the well, the court noted that failure to begin well maintenance when well production falls off gives rise to a current cause of action for the lessor. (Gray-Florida)
W76-02124

STATE V. BURTON (NO DAMAGES INVERSE EMINENT DOMAIN OR HIGHWAY CONSTRUCTION NOT CAUSE OF AN ALTERED DRAINAGE PATTERN).
514 P2d 244-50 (Arizona Court of Appeals 1973), 7 p.

Descriptors: *Arizona, *Construction, *Drainage, *Excess water(Soils), *Road construction, Damages, Sediment discharge, Land drainage, Surface drainage, Highway effects, Maximum probable flood, Alteration of flow, Peak flow, Water flow, Land appraisals, Construction, Silting, Runoff.
Identifiers: *Absolute liability, Jury instructions, Proximate causation.

Plaintiff property owner brought action to recover for damages caused by alteration of the local drainage pattern allegedly induced by defendant state's construction of an expressway on adjacent property. Plaintiff contended that an expressway drainage pipe dumped silt and water upon his property, with resulting decrease in value. Defendant agrued that plaintiff's property suffered from poor drainage prior to construction of the expressway, and that the drainage pipe in question had been plugged prior to the trial and thus could not have damaged plaintiff's property. Reversing the trial court's grant of a new trial the Court of Appeals of Arizona found the evidence sufficient to support the jury's finding that the highway construction had not caused an altered drainage pattern. (Gray-Florida)
W76-02125

ORCHARD MESA IRRIGATION DISTRICT V. CITY AND COUNTY OF DENVER (CHALLENGE TO DISTRICTS USE OF DUE DILIGENCE IN EXERCISING CONDITIONAL WATER RIGHTS).
511 P2d 25-28 (Colorado 1973), 4 p.

Descriptors: *Colorado, *Water contracts, *Regulated flow, *Use rates, *Regulation, Irrigated land, Irrigation, Relative rights, Water allocation(Policy), Permits, Judicial decisions, L review, Water permits, River regulation, Cont administration, Claims(Contracts)
Identifiers: *Administrative regulations, Bu of proof, Contingent claims.

Appellant irrigation district brought an ac requesting biennial determination of reason diligence regarding a conditional water ri decree. Appellant held one absolute direct decree from the Colorado River in addition to decree in question. Appellers, another water trict, along with the City and County of Den opposed the finding of diligence and claime right to divert water upstream. In affirming lower court's finding of a lack of reasona diligence and cancellation of the conditio decree, the Supreme Court of Colorado noted a showing of intent to use the water together w concrete actions toward finalizing the intended propriation is necessary to meet the burden proving due diligence with respect to conditio water decrees. The court also sustained a find that no action had been taken for fifty years apply the conditional decree to irrigation of lan supporting cancellation of the conditional dec (Gray-Florida)
W76-02126

COUNTY SEDIMENT CONTROL PROGRA (194 AMENDMENTS).
South Carolina Ann, sec 63-195.101 thru 195.106, (Cumm Supp 1974), 3 p.

Descriptors: *South Carolina, *Sediment cont *Water districts, *Erosion control, *Perm Grading, Soil conservation, Civil engineeri Management, Penalties(Legal), Mining, Gover mental interrelations, Repairing, Planning, Silti Construction.
Identifiers: *Siltation control.

This South Carolina statute authorizes counties establish sediments control programs. No grou shall be broken for construction of any kind und this statute, until a county grading permit is issu to the person responsible for such constructio No permit shall be issued until the applicant h submitted a plan to control erosion and siltati and such plan has been approved by the local s and water conservation district board. Each pl submitted is required to include a certification by registered professional engineer or a profession soil conservationist that the plan is designed carry silt to the maximum extent feasible. T statute allows exemptions from obtaining the gra ing permit for different segments, including: (commercial mining operations; (2) agricultur land management and cultural practices; (3) co struction of on farm buildings and structures use in a farming operation; (4) construction of sing family residences or their accessory building which are not a part of their residential subdiv sion; and (5) emergency repairs or maintenance existing structures and facilities which requi ground to be broken. Civil and criminal penalties are provided to enforce the provisions of th statute. (Hoffman-Florida)
W76-02127

POLLUTION CONTROL ACT (1973 AND 197 AMENDMENTS).
South Carolina Ann sec 63-195.36 (Cumm Sup 1974), 18 p.

Descriptors: *South Carolina, *Water quality stan dards, *Adoption of practices, *Water pollutio control, *Administrative agencies, Penal ties(Legal), Permits, Administration, Legislation Organic wastes, Waste disposal, Water properties Water quality, Legal aspects, Classification, Stan dards, Decision making, Regulation, State govern ments.
Identifiers: *Public hearings, *Administrative procedures.

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ollution Control Act establishes the Pollution
ol Authority of South Carolina. The Authori-
uthorized, after public hearings are held, to
pollution standards and to determine what
es and properties of water and air shall in-
a polluted condition. The standards adopted
omulgated and made a part of the rules and
tions of the Authority. The Pollution Control
xpressly enumerates the powers granted to
uthority and provides a list of factors which
be taken into consideration by the Authority
opting the classification of waters and the
rds of purity and quality. The Act also
it unlawful for any person to discharge into
aters of the State organic or inorganic matter
uses or tends to cause a conditions of pollu-
Both civil and criminal penalties are provided
orce this provision. Any person desiring to
any new outlet or to increase the discharge
n existing outlet must submit a permit appli-
to the Authority. The procedures involved
granting of such permits are presented. Set
also are administrative procedures concern-
e holding of public hearings required prior to
n prescribed actions by the Authority.
nan-Florida)
)2128

**LE EX REL GAZLAY V. MURRAY (NO
/EYANCE OF UNDERWATER LAND BY
NT WHEN NAVIGABLE WATERS FRAC-
ALIZE LAND).**
W2d 604-08 (Court of Appeals of Michigan,
5 p.

iptors: *Michigan, *Navigable waters,
ts, *Ownership of beds, *Public lands,
s, High water mark, Bays, Surveys, Land,
, Navigable rivers, Boundaries(Property),
, Streams, Expenditures, Remedies, Boun-
isputes.
fiers: *Submerged land, Water's edge.

iff Department of Natural Resources
ht this action to enjoin defendant lan-
ers from fillings a parcel of submerged land.
dant asserted that the land in question was
anted in a land patent by President Benjamin
son. Plaintiff contended that the land be-
l to the people of Michigan because it was
erged below navigable water, was on the
side of the high-water mark, and was not
d in the patent. Plaintiff also contended that
the land was transferred by the Federal
nment by a patent prior to Michigan's admis-
o the Union, the land belonged to the people.
court decided the case, however, by holding
he land in question was not covered by the
ranted by the patent from the United States.
Michigan obtained title to the land when it
dmitted to statehood. The court also found
he state was not estopped from claiming title
land, and that the Marketable Record Title
loes not apply against the state. (Segall-
la)
)2129

**E GAME AND FISH DEPARTMENT V.
E LAND DEPARTMENT (DENIAL OF AP-
RIATION OF WATER FROM GROUND-
ER BASIN).**
2d 621-23 (Court of Appeals of Arizona,
3 p.

iptors: *Administrative decisions,
opriation, *Groundwater basins, *Recharge,
ona, Application methods, Permits, Wildlife,
ation, Downstream, Construction, Tributa-
Pumping, Agriculture, Water table, Safety,
permits, Prior appropriation, Priorities,
voirs, Judicial decisions.
fiers: Underground waters.

lant Game and Fish Department applied for
nit to appropriate water to construct a reser-
nd store water for wildlife and recreational purposes. The water to be appropriated was the principle source of recharge of a groundwater basin in a critical groundwater area. The permit was denied. On appeal appellant contended that appellee State Land Department lacked authority to reject the application since the only protests to the appropriation had come from downstream users of underground waters; furthermore, appellee had abused its discretion in disallowing the application to appropriate waters. The Court of Appeals of Arizona holding that, even though downstream users had no vested rights in the water sought to be appropriated from the groundwater basin, appellee was not precluded from exercising its discretion, especially since the requested appropriation amounted to 1.7% of the total annual recharge of the groundwater basin in a critical groundwater area. (Segall-Florida)
W76-02130

PUTNAM V. CARROLL (SHORELINE MANAGEMENT ACT).
534 P2d 132-35 (Court of Appeals of Washington, 1975), 4 p.

Descriptors: *Environmental effects, *Shores, *Washington, *Permits, *Construction, Legislation, Grading, Retaining walls, Recreation facilities, Buildings, Environment, Rocks, Application methods, Governments, Shore protection.
Identifiers: *Shoreline Management Act, Shorelines, Mandamus.

Appellant property owner sought a writ of mandamus to compel the director of a county building department to issue permits necessary for construction of a planned development on property which was included on a plat filed in 1912. Appellant claimed an exemption under the Shoreline Management Act which provides that, under specified circumstances, no permit will be required for any development on shorelines included within preliminary plat approved by an authorized state agency. The Court of Appeals of Washington held that the plat exemption was not limited to developments described by the plat; however, before a writ of mandamus could issue, there would have to be a factual finding of whether the contemplated development was consistent with the policy of the Act. In reversing and remanding, the court held that if the contemplated development was consistent with all pertinent laws and ordinances, the permit would have to be issued. (Segall-Florida)
W76-02131

SURVEY PROBLEMS ALONG THE CALIFORNIA-ARIZONA BOUNDARY,
California State Lands Div., Sacramento. Granted Lands and Area Projects.
For primary bibliographic entry see Field 4A.
W76-02166

IRRIGATION DISTRICTS OF MEXICO (LOS DISTRITOS DE RIEGO DE MEXICO),
For primary bibliographic entry see Field 4A.
W76-02167

THE AWAKENED INTEREST IN THE SEWER ORDINANCE,
Camp Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 5G.
W76-02199

UNITED STATES-MEXICO WATER AGREEMENTS AND RELATED WATER USE IN MEXICALI VALLEY: A SUMMARY,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3C.
W76-02227

CONSTRAINTS ON WATER DEVELOPMENT BY THE APPROPRIATION DOCTRINE.
W. L. Lorah.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 158-162. 2 ref.

Descriptors: *Water law, *Prior appropriation, *Water rights, *Water policy, *Water resources development, *Beneficial use, Appropriation, Preferences(Water rights), Riparian rights, Water resources, Common law, Governments, Administrative agencies, Priorities, Planning, Reasonable use, Water utilization, Alternative water use, Water supply, *Institutional constraints.

Planning and development of water resources in the western United States must be based on an understanding of many factors, among which is the complex water law system called the Appropriation Doctrine. The two basic principles involved in the doctrine of prior appropriation are that beneficial use of the water gives the basis of the right to use the water, and that priority of use, not equality of right, determines allocation when there is not enough water to satisfy all appropriations. Under the Appropriation Doctrine, land ownership does not give the right to use water as does the riparian system. The problem is that those who beneficially used the water first, regardless of type of use or efficiency, obtained a perpetual right to always be first. The Appropriation Doctrine is changing along with the water allocations system as new water-use priorities emerge along with changing quality standards. Government at all levels, along with planners and engineers, must understand the institutional and legal constraints put on water development by the historic water rights system so that intelligent decisions can be made in developing and maintaining natural water resources. (Robinett-Arizona)
W76-02234

OPTIMAL LEASING POLICY FOR THE DEVELOPMENT OF OUTER CONTINENTAL SHELF HYDROCARBON RESOURCES,
Amos Tuck School of Business Administration, Hanover, N.H.
D. E. Logue, R. J. Sweeney, and T. D. Willett.
Land Economics, Vol L1, No 3, p 191-207, 1975. 1 fig, 18 ref.

Descriptors: *Oil, *Leases, Continental shelf, Pricing, Competition, United States, Exploitation, Bids, Royalties, Profit, Risks, Return(Monetary), Economic efficiency.
Identifiers: Government policy, Allocation, Government revenue, Depletion allowance, Cash-bonus bids.

The current U.S. leasing policy for hydrocarbon exploration on the Outer Continental Shelf is described as well as the rate of lease offerings and determining the allocation of leases. The conclusions are that competitive bidding appears the norm for offshore leases. Alternative allocation plans are examined; the present cash-bonus bid system is favored as it yields the greatest revenue for the government, but it could be modified to allow for installment payments. A royalty system may yield more revenue but may also lead to premature shut-down of production and is not favored. The rate of offering of areas for lease could be accelerated which may lead to more competitive pressures and increase production. (Carpenter-Wisconsin)
W76-02375

REPORT TO INTERNATIONAL JOINT COMMISSION, UNITED STATES AND CANADA, GREAT LAKES WATER QUALITY,STATUS OF PERTINENT EPA RESEARCH,
National Environmental Research Center, Corvallis, Oreg.

For primary bibliographic entry see Field 5G.
W76-02451

6F. Nonstructural Alternatives

FLOOD PLAIN MAPPING: PHOTOGRAMMETRIC DATA FOR HYDROLOGY,
Hurd (Mark) Aerial Surveys, Inc., Minneapolis, Minn.
For primary bibliographic entry see Field 7C.
W76-02164

APPLICATION OF REMOTE SENSING IN FLOODWAY DELINEATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 7B.
W76-02244

6G. Ecologic Impact Of Water Development

THERMAL ECOLOGY.
For primary bibliographic entry see Field 5C.
W76-02004

SYNERGISTIC EFFECTS OF TEMPERATURE AND OTHER ENVIRONMENTAL PARAMETERS ON ORGANISMS,
South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.
For primary bibliographic entry see Field 5C.
W76-02007

RESOURCE SCARCITY, ECNOMIC GROWTH AND THE ENVIRONMENT.
For primary bibliographic entry see Field 6E.
W76-02079

MAKING ENVIRONMENTAL LEGISLATION WORK,
Minnesota Mining and Mfg. Co., St. Paul.
For primary bibliographic entry see Field 6E.
W76-02093

NATIONAL WILD AND SCENIC RIVERS SYSTEMS, P.L. 93-279--LEGISLATIVE HISTORY.
For primary bibliographic entry see Field 6E.
W76-02097

MANAGEMENT OF MOUNTAIN WATERSHEDS.
For primary bibliographic entry see Field 4D.
W76-02169

WATER RESOURCES RESEARCH ON FOREST AND RANGELANDS IN ARIZONA,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4A.
W76-02220

CANYON CREEK MANAGEMENT ANALYSIS,
Forest Service (USDA), Albuquerque, N. Mex.
For primary bibliographic entry see Field 4C.
W76-02242

HYDROLOGIC ASPECTS OF LAND-USE PLANNING AT TUMAMOC HILL, TUCSON, ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 4A.
W76-02245

BOISE POST-AUDIT STUDY, PLAN OF STUDY SUBPROJECT REPORT,
Idaho Dept. of Water Resources, Boise; and Idaho Dept. of Water Resources Board, Boise.
For primary bibliographic entry see Field 6B.
W76-02373

BOISE POST-AUDIT STUDY, ECONOMIC AND ECOLOGICAL HISTORY SUPPORT STUDY,
Idaho Univ., Moscow. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W76-02374

ENVIRONMENTAL CONSIDERATIONS IN FUTURE ENERGY GROWTH.
Battelle Columbus Lab., Ohio.
Available from the National Technical Information Service, Springfield Va 22161 as PB239-157, $16.25 in paper copy, $2.25 in microfiche. Report No EPA-600/5-73-004, April 1973. 631 p, 71 fig, 182 tab, 362 ref. EPA 68-01-0470.

Descriptors: *Environmental effects, *Energy conversion, *Costs, *Pollutants, *Pollution abatement, Effluents, Fuels, Decision making, Air pollution, Water pollution, Coals, Natural gas, Solid wastes, Oil, Technology, Alternative planning, Nuclear energy, Computer programs, Electric power production, Heating, Nuclear wastes, Solar radiation, Tides, Thermal powerplants, Insulation, Fossil fuels, Separation techniques, Transportation, Storage, Consumptive use.
Identifiers: Emissions, Energy systems pollution potential, Energy emissions inventory, Nuclear fusion, Geothermal energy, Fuel cells, Waste heat utilization.

The environmental burdens associated with uses of alternative fuel sources for energy generation are compiled and ranked as to their pollution potential. Details are given for emissions, water pollution, and solid waste generation during extracting and cleaning, transport, storage, conversion, processing of fractions, utilization processes, and pollution control costs, development costs for fossil fuels and nuclear energy systems. These are ranked by computer programs to facilitate evaluation of any energy system by testing preferred weighting factors. In order to establish which other energy systems should have preferential development, the environmental impact, energy potential, development costs, capital costs, and cost of converting energy were investigated for fuel cells, solar, tidal, fusion, breeder reactors, hydrogen, geothermal, energy storage, magnetohydrodynamics, thermoelectric, thermionic, waste heat recovery, space heating, insulation, and heat pumps, and all are ranked environmentally. Those judged to exhibit major potential for supplying significant portions of future energy with reduced environmental impact are geothermal, solar, and nuclear fusion. Air emissions from coal-based systems can be reduced by application of advanced technology while minimizing the attendant increase in solid wastes. Technology advances will be able to minimize the water and solid waste burdens produced through coal utilization. (Auen-Wisconsin)
W76-02428

POTENTIAL ENVIRONMENTAL PROBLEMS OF DREDGING AND DREDGED MATERIAL DISPOSAL: DREDGED MATERIAL DISPOSAL CRITERIA,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W76-02449

7. RESOURCES DATA

7A. Network Design

WATER RESOURCES INFORMATION FOR THE NORTHWEST FLORIDA MANAGEMENT DISTRICT.
Geological Survey, Tallahassee, Fla
For primary bibliographic entry see Field 4.
W76-02138

7B. Data Acquisition

THIRD EARTH RESOURCES TECHNO SATELLITE-1 SYMPOSIUM VOLUM TECHNICAL PRESENTATIONS, SECTIO
National Aeronautics and Space Adminis Washington, D.C., Scientific and Technica mation Div.
NASA SP-351, Section B, Proceedings o posium held December 10-14, 1973, Wash D.C., 1974, 1017 p, Freden, S C, Mercan and Becker, M A, editors.

Descriptors: *Remote *Satellites(Artificial), *Conferences, * resources, *Water resources, *Mapping, D lections, Data processing, Analytical tech Environment, Oceanography, Surface Snow cover, Polar regions, Land use, Estuarine environment.
Identifiers: ERTS.

The symposium was the third in a series on nificant results obtained from the first Resources Technology Satellite (E Volume 1, Section B, contains technical presented at the symposium on water res marine resources, environment surveys, terpretation techniques. (See W76-0202 W76-02068) (Humphreys-ISWS)
W76-02026

MAPPING SNOW EXTENT IN THE VERDE WATERSHED AND THE SOUT SIERRA NEVADA USING ERTS IMAGER
Environmental Research and Technolog Lexington, Mass.
J. C. Barnes, C. J. Bowley, and D. A. Simm In: Third Earth Resources Technology Sa Symposium, Volume 1: Technical Present Section B, NASA SP-351, Proceedings of soium held December 10-14, 1973, Wash D.C., p 977-993, 1974. 10 fig, 1 tab, 12 ref.

Descriptors: *Satellites(Artificial), * sensing, *Snow surveys, *Arizona, *Cal Aerial photography, Snow cover, Snow Snow, Mapping, Water sources, Water Water resources, Mountains, Watersheds(E Data collections.
Identifiers: *ERTS, *Sierra Nevada(Calif) Verde watershed(Ariz).

In much of the western United States a lar of the utilized water comes from accu mountain snowpacks; thus, accurate m ments of snow distributions are required fo to streamflow prediction models. The appl of ERTS imagery for mapping snow was ev for two geographic areas, the Salt Watershed in central Arizona and the so Sierra Nevada in California. Technique developed to identify snow and to differ between snow and cloud. The snow ext these two drainage areas was mapped fr MSS-5 (0.6-0.7 micrometer) imagery and pared with aerial survey snow charts, photography, and ground-based snow m ments. Based on the results of the complet analyses, it was concluded that the amoun formation in ERTS imagery with practical a tion to snow mapping is substantial. The

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wbacks to the use of ERTS data as input to an rational system are the availability of the data the rate of repetitive coverage. (See also W76-26) (Sims-ISWS)
6-02027

OW-EXTENT MAPPING AND LAKE ICE DIES USING ERTS-1 MSS TOGETHER TH NOAA-2 VHRR,
ional Environmental Satellite Service, shington, D.C.
R. Wiesnet, and D. F. McGinnis, Jr.
Third Earth Resources Technology Satellite-1 nposium, Volume 1: Technical Presentations, tion B, NASA SP-351, Proceedings of Sym-ium held December 10-14, 1973, Washington, C., p 995-1009, 1974. 8 fig, 2 tab, 6 ref.

criptors: *Satellites(Artificial), *Remote sing, *Snow surveys, *Mapping, *Lake ice, ial photography, Great Lakes, Lake Ontario, e Erie, Snow cover, Snowpacks, Snow, Water ply, Water resources, Mountains, Lakes, Melt-Ice, Watersheds(Basins), Data collections.
ntifiers: *ERTS, Sierra Nevada(Calif), Amer-River basin(Calif).

e snow extent maps of the 5601 sq km Amer-River basin were prepared using a Zoom nsfer Scope from ERTS-1 MSS band 4 gery. The maps were generally completed hin one hour. A snow melt curve based on TS-1 imagery was used as a 'calibration' stan-d or comparison for maps prepared from AA-2 VHRR imagery in the same manner. t comparisons with U-2 derived imagery in-ated that ERTS-1 snow mapping of the basins ix times faster. Conservative estimates of com-able aircraft snow survey flights yields a cost re 200 times that of the ERTS-1 snow map. w mapping attempts in the Lake Ontario basin nonstrated that ERTS-1 is not well suited to e basins. Optimum size of basins for ERTS dies is believed to range from about 250 sq km 0,000 sq km. The value of the ERTS-1 MSS for at Lake ice evaluation was proved during the t winter on Lake Erie. Not only were ice fea-es and types of ice identified, but melting ice s detected through the combined use of band 5 -0.7 micrometer) and band 7 (0.8-1.1 microme-. Ice movement (direction and speed) was pped by examining imagery from two succes-e days. The resolution of NOAA-2's VHRR s checked by comparison of ice leads as seen in MSS band 5. (See also W76-02026) (Sims-VS)
6-02028

TS-1 DATA IN SUPPORT OF THE NA-ONAL PROGRAM OF INSPECTION OF MS,
tional Aeronautics and Space Admistration, uston, Tex. Lyndon B. Johnson Space Center.
primary bibliographic entry see Field 7C.
6-02029

NAMICS OF PLAYA LAKES IN THE TEXAS GH PLAINS,
xas Tech Univ., Lubbock.
C. Reeves, Jr.
Third Earth Resources Technology Satellite-1 nposium, Volume 1: Technical Presentations, tion B, NASA SP-351, Proceedings of Sym-ium held December 10-14, 1973, Washington, C., p 1041-1069, 1974. 14 fig, 5 tab, 4 ref.

scriptors: *Satellites(Artificial), *Remote sing, *Lakes, *Playas, *Texas, Surveys, Arid nates, Data processing, Analytical techniques, ter levels, Lake stages, Basins, Geology, Soils, a collections, On-site tests, Instrumentation.
ntifiers: *ERTS.

e Double Lakes playas complex in Lynn Coun-Texas, was instrumented as an ERTS-1 test site. Color composites using an electronic density profile have been particularly useful for distinguishing the exact water area from the muddy areas of the Double Lakes playas, and for determining the salt crust areas. Color composites also portray gradations in water transparency due to depth fluctuations, suspended sediment, or algae much better than the single MSS bands. Analysis of Bands 6 and 7 of ERTS-1 MSS imagery, showed that lake basins as small as 200 m in diameter (+ or - 10 acres) can be reliably classified as being 'wet' or 'dry', thus supplying the methodology for a rapid, periodic census of surface water. (See also W76-02026) (Sims-ISWS)
W76-02030

MEASURING WATERSHED RUNOFF CAPABILITY WITH ERTS DATA,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 7C.
W76-02031

RETRANSMISSION OF WATER RESOURCES DATA USING THE ERTS-1 DATA COLLECTION SYSTEM,
Department of the Environment, Ottawa (Ontario).
R. A. Halliday, I. A. Reid, and E. F. Chapman.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B, NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1113-1126, 1974. 3 fig, 3 tab, 5 ref.

Descriptors: *Satellites(Artificial), *Telemetry, *Stream gages, *Canada, Instrumentation, Data collections, Hydrologic data, Streamflow, Water levels, Precipitation(Atmospheric), Temperature, Ice, Runoff, Water resources, Measurement, Data processing, Communication, Remote sensing.
Identifiers: *ERTS, Sensors, Data collection plantforms.

The Water Survey of Canada operates a network of approximately 2400 gaging stations at which water level data are collected. In most cases the water level data are used in conjunction with periodic discharge measurements to produce daily river discharge data. In many cases it would be desirable to obtain data on a near real time basis. However, the isolated locations of most of the gaging stations have made the cost of land line telemetry prohibitive. Therefore, when the ERTS Data Collection System became available in 1972 it seemed worthwhile to investigate the possibility of using a satellite retransmission system to collect discrete water level readings at least once daily from a few gaging stations and to use these data for operational purposes. To perform this assessment, nine Data Collection Platforms (DCPs) were installed in isolated areas of northern and western Canada. Results of the project have been excellent. There has been no data loss that can be attributed to failure of a DCP, although data were lost because of sensor malfunctions. The quality of data collected compares favorably with that of the hard record obtained at the remote sites. Costs of using the ERTS Data Collection System are reasonable. (See also W76-02026) (Sims-ISWS)
W76-02032

ERTS-1 FLOOD HAZARD STUDIES IN THE MISSISSIPPI RIVER BASIN,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
A. Rango, and A. T. Anderson.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B, NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1127-1166, 1974. 16 fig, 1 tab, 15 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Floods, *Mississippi River basin, Mississippi River, Flood plains, Design flood, Historic floods, Flooding, Rivers, Flood recurrence interval, Land forming, Vegetation, Soil moisture, Data processing, Analytical techniques, Mapping, Flood data.
Identifiers: *ERTS.

The Spring 1973 Mississippi River flood was investigated using remotely sensed data from ERTS-1. Both manual and automatic analyses of the data indicated that ERTS-1 is extremely useful as a regional tool for flood and floodplain management. Automatic digital analysis using the GEMS system was employed to obtain quantitative estimates of area flooded in small test sites 1225 sq km in area in St. Charles County, Missouri, and the delta region of northwest Mississippi. In the St. Charles site 265 sq km (21% of the total area) was calculated to be flooded; whereas, in the northwest Mississippi site, 480 sq km (39%) was inundated with an additional amount of high forest submerged beneath the canopy. In the entire state of Arkansas, manual photo interpretation indicated that 7300 sq km was inundated with only 630 sq km flooded along the Mississippi River mainstem. The maximum error of such flood area measurements was conservatively estimated to be less than 5%. Change detection analysis indicated that the flood had major impacts on soil moisture, land pattern stability, and vegetation stress. (See also W76-02026) (Sims-ISWS)
W76-02033

APPLICATION OF ERTS IMAGERY TO ENVIRONMENTAL STUDIES OF LAKE CHAMPLAIN,
Vermont Univ., Burlington.
A. O. Lind.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentation, Section B, NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1189-1196, 1974. 8 fig, 1 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Lakes, *Environment, *Vermont, *New York, Water pollution, Floods, Turbidity, Lake ice, Pulp and paper industry, Effluents, Industrial wastes, Erosion, Shores, Legal aspects.
Identifiers: *ERTS, *Lake Champlain(Vt).

ERTS imagery has provided data relating to a number of environmental and limnological concerns such as water quality, lake flooding, and lake ice formation. Pollution plume data provided by ERTS was recently used in the Supreme Court case involving the states of Vermont and New York and a paper company. Flooding of lowland tracts has been a major concern due to a repetitive pattern of high lake levels over the past three years, and ERTS imagery is being used to construct the first series of flood maps of the affected areas. Lake ice development and turbidity patterns have also been studied from ERTS, since these have significance for shore erosion studies. (See also W76-02026) (Sims-ISWS)
W76-02034

A REAL TIME DATA ACQUISITION SYSTEM BY SATELLITE RELAY,
Corps of Engineers, Walthan, Mass. New England Div.
S. Cooper.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B, NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1197-1212, 1974. 5 fig, 6 tab.

Descriptors: *Satellites(Artificial), *Telemetry, *Stream gages, *Hydrologic data, *New England, *Northeast U.S., River forecasting, Data collections, Instrumentation, Measurement, Communication, Rainfall, Runoff, Remote sensing.
Identifiers: *ERTS, Data collection platforms.

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The New England region is comprised of several small watersheds, draining hilly terrain. With the high density population centers in the southern three states come the perennial problems of flood damage and flood protection. Because of the high development that has taken place along the main stems of rivers since the industrial revolution, nearly all the reservoirs are situated on tributaries where time of concentration and reaction time from rainfall to floodflows are short. In 1969, the New England Division, Corps of Engineers, installed an Automatic Hydrologic Radio Reporting Network consisting of 41 remote reporting stations and controlled by a computer to help in the regulating its flood protection system. Data collection Platforms (DCPs) have been installed throughout the New England area from Fort Kent, Maine, to Stanford, Connecticut. The sites were selected to provide an overall assessment of environmental conditions. Results showed that the DCPs are reliable and useful. Satellite data collection appears feasible on a nationwide basis. (See also W76-02026) (Sims-ISWS)
W76-02035

APPLICATIONS OF ERTS DATA TO COASTAL WETLAND ECOLOGY WITH SPECIAL REFERENCE TO PLANT COMMUNITY MAPPING AND TYPING AND IMPACT OF MAN,
American Univ., Washington, D.C., Dept. of Biology.
R. R. Anderson, V. Carter, and J. McGinnis.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B, NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1225-1242, 1974. 13 fig, 4 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Wetlands, *Ecology, *Atlantic Coatal Plain, Coasts, Analytical techniques, Data processing, Vegetation, Coastal marshes, Marshes, Marsh plants, Mapping, Marsh management, Dredging, Highways, Drainage, Lagoons, Swamps, Shallow water.
Identifiers: *ERTS, Wetlands type.

Complete seasonal ERTS-1 coverage of Atlantic coastal wetlands from Delaware Bay to Georgia provided a basis for assessment of temporal data for wetland mapping, evaluation, and monitoring. Both MSS imagery and digital data have proved useful for gross wetland species delineation and determination of the upper wetland boundary. Tidal effects and (band to band or seasonal) spectral reflectance differences made it possible to type vegetatively coastal wetlands in salinity related categories. Management areas, spoil disposal sites, drainage ditches, lagoon-type developments and highway construction can be detected, indicated a monitoring potential for the future. (See also W76-02026) (Sims-ISWS)
W76-02036

INVENTORIES OF DELAWARE'S COASTAL VEGETATION AND LAND-USE UTILIZING DIGITAL PROCESSING OF ERTS-1 IMAGERY,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, D. Bartlett, R. Rogers, and L. Reed.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presenations, Section B, NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1243-1255, 1974. 3 fig, 3 tab, 5 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Vegetation, *Land use, *Delaware, *Coasts, Coastal plains, Coastal marshes, Wetlands, Marshes, Marsh plants, Shoreline cover, Grasses, Data processing, Analytical techniques, Computers, Land management, Surveys, Mapping, Agriculture, Urbanization.
Identifiers: *ERTS.

Digital analysis of ERTS-1 imagery was used in an attempt to map and inventory the significant ecological communities of Delaware's coastal zone. Eight vegetation and land use discrimination classes were selected as follows: (1) Phragmites communis (Giant Reed grass), (2) Spartina alterniflora (Salt marsh cord grass), (3) Spartina patens (Salt marsh hay), (4) shallow water and exposed mud, (5) deep water (less than 2 meters), (6) forest, (7) agriculture, and (8) exposed sand concrete. Canonical analysis showed that classification accuracy was quite good with Spartina alterniflora; exposed sand, concrete, and forested land were all discriminated with between 94% and 100% accuracy. The shallow water-mud and deep water categories were classified with accuracies of 88% and 93% respectively, with all errors in classification occurring as one water category being classed as the other. Phragmites cummunis showed a classification accuracy of 83% with all confusion occurring with Spartina patens which may be due to use of mixed stands of these species as training sets. Discrimination of Spartina patens was very poor (accuracy equals 52%) due to difficulties in locating large, pure stands of S. patens for use as training sets. Classification accuracy for agriculture was also very poor (51%). (See also W76-02026) (Sims-ISWS)
W76-02037

EVALUATION OF REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS,
National Aeronautics and Space Administration, Bay Saint Louis, Miss. Earth Resources Lab.
For primary bibliographic entry see Field 7C.
W76-02038

RELATIONSHIPS BETWEEN ERTS RADIANCES AND GRADIENTS ACROSS OCEANIC FRONTS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
G. A. Maul, and H. R. Gordon.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B, NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1279-1308, 1974. 13 fig, 1 tab, 20 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Ocean currents, *Gulf of Mexico, Data processing, Analytical techniques, Reflectance, Color, Chlorophyll, Plankton, Salinity, Temperature, Oceans, Oceanography.
Identifiers: *ERTS, Loop current, Fronts(Oceanic).

A time series of the Loop Current in the Gulf of Mexico, covering an annual cycle of growth, spreading and decay, has been obtained in synchronization with ERTS. Computer enhanced images, which are necessary to extract useful oceanic information, showed that the current can be observed either by color or sea state effects associated withe the cyclonic boundary. The color effect related to the spectral variations in the optical properties of the water and its suspended particles, and was studied by radiative transfer theory. Significant oceanic parameters identified were the probability of forward scattering and the ratio of scattering to total attenuation. Several spectra of upwelling diffuse light were computed as a function of the concentration of particles and yellow substance. These calculations compared favorably with experimental measurements and showed that the ratio of channels method give ambiguous interpretative results. The results were used to discuss features in images where surface measurements were obtained and were extended to tentative explanation in others. (See also W76-02026) (Sims-ISWS)
W76-02039

OCEAN INTERNAL WAVES OFF THE NO AMERICAN AND AFRICAN COASTS F ERTS-1,
National Oceanic and Atmospheric Admin tion, Miami, Fla. Atlantic Oceanographic Meteorological Lab.
J. R. Apel, and R. L. Charnell
In: Third Earth Resources Technology Satel Symposium, Volume 1: Technical Presentat Section B, NASA SP-351, Proceedings of posium held December 10-14, 1973, Washin D.C., p 1309-1316, 1974. 4 fig.

Descriptors: *Satellites(Artificial), *Re sensing, *Internal waves, *Atlantic O *Africa, Oceans, Waves(Water), Ocean w Wavelengths, Continental shelf, Anal techniques, Data processing, Oceanography.
Identifiers: *ERTS, *New York Bight.

Periodic features observed in the ocean por of certain ERTS-1 images have been iden with reasonable certainty as surface manif tions of oceanic internal gravity waves. A seri images taken over the New York Bight, comm ing in July 1972 and continuing on into autum 1973, has shown the internal waves to be pr when summer solar heating stratifies the sufficiently well to support such oscilla When fall and winter wind action mixes the water down to the bottom, the waves no longe pear. In the Bight, the wavelengths range fro proximately 400 to 1000 m, with the wave being most sharply delineated near the edg the continental shelf, at the mouth of the Hu Canyon. They appear in packets consistin several waves separated by 10-15 km, propagate up on the shelf and disappear. waves have also been detected off the east west coasts of Africa, where the wavelength proach 4 km. On the western continental they appear in packets separated by 30-40 km are highly phase-oriented parallel to the bo shelf topography. (See also W76-02026) (S ISWS)
W76-02040

A REVIEW OF INITIAL INVESTIGATIONS UTILIZE ERTS-1 DATA IN DETERMIN THE AVAILABILITY AND DISTRIBUTION LIVING MARINE RESOURCES,
National Marine Fisheries Service, Bay Louis, Miss. Fisheries Engineering Lab.
W. H. Stevenson, A. J. Kemmerer, B. H. Atw and P. M. Maughan.
In: Third Earth Resources Technology Satel Symposium, Volume 1: Technical Presentat Section B. NASA SP-351, Proceedings of posium held December 10-14, 1973, Washin D.C., p 1317-1331, 1974. 9 fig, 8 ref.

Descriptors: *Satellites(Artificial), *Re sensing, *Marine fisheries, *Aerial photogra *Gulf of Mexico, Data processing, Fish, Atl menhaden, Fisheries, Commercial fis Estuarine fisheries, Estuaries, Fish populatio
Identifiers: *ERTS, *Mississippi Sound.

A 15-month study was initiated in July 1972 t determine the reliability of satellite and hig titude sensors to provide data about oce graphic parameters in coastal waters, (2) de strate the use of remotely sensed oceanogra information to predict the distribution abundance of adult menhaden, and (3) de strate the potential of using satellite-acquire formation for improving the harvest and mar ment of a fishery resource. The study focuse coastal areas in the north central portion o Gulf of Mexico including parts of Alabama, sissippi and Louisiana. The area used in the analysis was limited to the Mississippi Sound proximately 145 kilometers long and 16 kilom wide, with an average water depth of about 3.7 ters, and in general characterizes an estuarin vironment. A small industrial fish, comm called menhaden, was selected as the target

Menhaden were selected because their sur- schooling pelagic nature makes them well d to satellite and aircraft remote sensing, and use they support an important commercial ry actively pursuing advanced technology to e varied problems. It was shown that relation- exist between certain oceanographic meters and the distribution of menhaden, and these relationships may have potential appli- n for commercial fishing and resource assess- . (See also W76-02026) (Sims-ISWS)
-02041

ATING COASTAL AND NAVIGATIONAL RTS USING ERTS-1 DATA,
ronmental Research Inst. of Michigan, Ann r.
Polcyn, and D. R. Lyzenga.
Third Earth Resources Technology Satellite-1 posium, Volume 1: Technical Presentations, ion B. NASA SP-351, Proceedings of Sym- um held December 10-14, 1973, Washington, , p1333-1346, 1974, 10 fig, 2 tab, 3 ref.

riptors: *Satellites(Artificial), *Remote ing, *Navigation, *Maps, *Lake Michigan, h hydrography, Navigable waters, Shoals, low waters, Ships, Hazards, Charts, Mapping, eys, Erosion, Sedimentation, Lakes, Oceans, processing.
tifiers: *ERTS, *Little Bahama Bank.

ccessful processing algorithm for extracting r depth information from ERTS data has been loped. Depth charts for two geographical s have been constructed representing different illumination and water transparency condi- . Absolute depth calculations for water depth 5 fathoms have been demonstrated for the Lit- Bahama Bank. Depth Charts also were con- ted using data in Band 4 and 5 of the ERTS-1 for areas in Lake Michigan. This data esented a low sun angle, poor light transmis- in water conditions and gave useful results to eters. In both cases, the ERTS map esented an update in shallow water detail in parison with available navigation charts for areas tested. (See also W76-02026) (Sims- S)
-02042

IMENT CONCENTRATION MAPPING IN AL ESTUARIES,
y Engineer Waterways Experiment Station, sburg, Miss. Mobility and Environmental ems Lab.
. Williamson, and W. E. Grabau.
Third Earth Resources Technology Satellite-1 posium, Volume 1: Technical Presentations, ion B. NASA SP-351, Proceedings of Sym- um held December 10-14, 1973, Washington, , p1347-1386, 1974. 25 fig, 1 ref.

riptors: *Satellites(Artificial), *Remote ing, *Estuaries, *Sediment load, *Southeast , *Chesapeake Bay, Data processing, Analyti- techniques, Spectrophotometry, Suspended s, Sediment discharge, Effluents, Bodies of r, Surface waters, Rivers, Lakes, Mapping.
ifiers: *ERTS, Spectrum matching.

nalytical procedure has been developed that iders the ERTS-1 multispectral scanner as a ctance spectrophotometer. ADP techniques iring only very limited computer capability utilized to search the data defining the spec- reflectance characteristics of a scene on a -by-pixel basis, identify each pixel whose tral reflectance matches a reference spec- , and generate maps that identify pixel loca- where spectrum matches occur and the spec- that was matched. If the reference spectra nown to represent a specific condition on the nd, a map of the distribution of that condition e out-put as a dimensionally accurate overlay aps of any selected scale. Two applications were described in this report: (1) mapping the distribution of water masses exhibiting specific suspended sediment concentrations, and (2) determining the location and delineation of surface water bodies in the southeastern U.S. (See also W76-02026) (Sims-ISWS)
W76-02043

MONITORING COASTAL WATER PROPERTIES AND CURRENT CIRCULATION WITH ERTS-1,
Delaware Univ., Newark.
V. Klemas, M. Otley, C. Wethe, and R. Rogers.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1387-1411, 18 fig, 1 tab, 15 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Bays, *Estuaries, *Delaware, *New Jersey, Circulation, Turbidity, Currents(Water), Waste disposal, Sediments, Suspended solids, Tides, Tidal waters, Tidal bores, Data processing, Analytical techniques, On-site investigations.
Identifiers: *ERTS, *Delaware Bay, Convergent boundaries.

Imagery and digital tapes from nine successful ERTS-1 passes over Delaware Bay during different portions of the tidal cycle have been analyzed with special emphasis on turbidity, current circulation, waste disposal plumes, and convergent boundaries between different water masses. ERTS-1 image radiance correlated well with Secchi depth and suspended sediment concentration. Circulation patterns observed by ERTS-1 during different parts of the tidal cycle agreed well with predicted and measured currents throughout Delaware Bay. Convergent shear boundaries between different water masses were observed from ERTS-1. In several ERTS-1 frames, waste disposal plumes have been detected 36 miles off Delaware's Atlantic coast. The ERTS-1 results are being used to extend and verify hydrodynamic models of the bay, developed for predicting oil slick movement and estimating sediment transport. (See also W76-02026) (Sims-ISWS)
W76-02044

CALIFORNIA COASTAL PROCESSES STUDY,
Corps of Engineers, San Francisco, Calif. South Pacific Div.
D. M. Pirie, and D. D. Steller.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1413-1446, 1974, 15 fig, 1 tab, 17 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *California, *Coasts, Estuaries, Bays, Rivers, Discharge(Water), Sediments, Currents(Water), Sediment transport, Upwelling, Suspended solids, Turbidity, Seasonal, Planning, Construction, Data processing, Analytical techniques, Aerial photography.
Identifiers: *ERTS.

Preliminary findings and applications derived from ERTS-1 satellite imagery of the nearshore coastal processes of the California coast were presented. Objectives were to analyze nearshore currents, sediment transport, and estuarine and river discharges along the California coast through the use of synoptic and repetitive imagery from ERTS as well as aircraft underflights and surface data. The major conclusions were: (1) distinct seasonal patterns for sediment transport as a function of the oceanic current systems and coastal morphology have been identified; (2) large scale sediment plumes from intermittent streams and rivers extend offshore to previously unanticipated ranges, and areas where these plumes contain possible contamination from onshore activities can be traced in detail; (3) computer-generated contouring of radiance levels from computer-compatible tapes result in charts that can be used for determination of surface and nearsurface suspended sediment distribution; (4) flying spot scanner enhancement results in details of nearshore features; and (5) data from this ERTS study is providing significant information for coastal planning and construction projects. (See also W76-02026) (Sims-ISWS)
W76-02045

THE UTILIZATION OF ERTS-1 DATA FOR THE STUDY OF THE FRENCH ATLANTIC LITTORAL,
Institut Geographique National, Paris (France).
P. G. Demathieu, and F. H. Verger.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1447-1450, 1974. 1 fig.

Descriptors: *Satellites(Artificial), *Remote sensing, *Coasts, *Atlantic Ocean, Littoral, Geomorphology, Rivers, Estuaries, Turbidity, Sediments, Ocean currents, Currents(Water), Data processing, Analytical techniques.
Identifiers: *ERTS, *France, *Loire River.

The French Atlantic Littoral (FRALIT) program uses ERTS-1 data to study coastal geomorphology and waters. ERTS-1 gives an overall picture of the phenomena for the first time due mainly to channel 4 data, but the other channels also contribute valuable complementary data on superficial waters. These studies have already resulted in accurate maps of the mud transported southwestward from the mouth of the River Loire. (See also W76-02026) (Sims-ISWS)
W76-02046

MONITORING ARCTIC SEA ICE USING ERTS IMAGERY,
Environmental Research and Technology, Inc. Lexington, Mass.
J. C. Barnes, and C. J. Bowley.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1453-1465, 1974, 9 fig, 13 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Sea ice, *Arctic Ocean, Monitoring, Surveys, Ice, Arctic, Cold regions, Ice cover, Analytical techniques, Aerial photography, Infrared radiation, Mapping.
Identifiers: *ERTS, *Beaufort Sea, *Bering Sea.

Because of the effect of sea ice on the heat balance of the Arctic and because of the expanding economic interest in arctic oil and other minerals, extensive monitoring and further study of sea ice is required. The application of ERTS data for mapping ice was evaluated for several arctic areas, including the Bering Sea, the eastern Beaufort Sea, parts of the Canadian Archipelago, and the Greenland Sea. Interpretive techniques were discussed, and the scales and types of ice features that can be detected were described. For the Bering Sea, a sample of ERTS imagery was compared with visual ice reports and aerial photography from the NASA CV-990 aircraft. Essentially all of the significant ice features near St. Lawrence Island visible in the aerial photographs taken from the CV-990 can also be detected in the ERTS imagery. It seem entirely feasible, therefore, that ERTS imagery could be used to replace some currently flown aerial surveys, at a considerable cost saving. (See also W76-02026) (Sims-ISWS)
W76-02047

LIBRARY U. OF I. URBANA-CHAMPAIGN

APPLICABILITY OF ERTS TO ANTARACTIC ICEBERG RESOURCES,
Rand Corp., Santa Monica, Calif.
J. L. Hult, and N. C. Ostrander.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p1467-1490, 6 fig, 8 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Icebergs, *Water resources, *Antarctic Ocean, *Antarctic, Cold regions, Water supply, Ice, Sea ice, Transportation, Harvesting, Monitoring, Surveys, Cloud cover.
Identifiers: *ERTS.

The applicability of ERTS to determine tha Antarctic sea-ice and environmental behavior that may influence the harvesting of icebergs, and to monitor iceberg locations, characteristics, and evolution was explored. Imagery sampling in the estern Antarctic between the Peninsula and the Ross Sea was used in the analysis. It was found that the potential applicability of ERTS to the research, planning, and harvesting operations can contribute importantly to the promise derived from broader scope studies for the use of Antarctic icebergs to relieve a growing global need for fresh water. Live Antarctic readout will permit timely acquisition of imagery on every orbital pass, which will be necessary to achieve adequate glimpses through the 80% cloud cover. Thermal sensor bands will provide coverage in daylight or darkness. Several years of comprehensive monitoring will be necessary to characterize sea-ice and environmental behavior and iceberg evolution. Live ERTS services will assist harvesting control and claiming operations and offer a means for harmonizing entitlements to iceberg resources. The valuable ERTS services will be more cost effective than other means and will be easily justified and borne by the iceberg harvesting operations. (See also W76-02026) (Sims-ISWS)
W76-02048

APPLICATIONS OF ERTS-1 IMAGERY TO TERRESTRIAL AND MARINE ENVIRONMENTAL ANALYSES IN ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. M. Anderson, H. L. McKim, W. K. Crowder, R. K. Haugen, and L. W. Gatto.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1575-1606, 1974. 12 fig, 1 tab, 32 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Environment, *Alaska, Estuaries, Estuarine environment, Coasts, Tides,Pipelines, Oil spills, Geology, Rivers, Ice, Ice jams, Vegetation, Permafrost, Sea ice, Cold regions.
Identifiers: *ERTS.

ERTS-1 imagery provides a means of distinguishing and monitoring estuarine surface water circulation patterns and changes in the relative sediment load of discharging rivers on a regional basis. This information is being used to produce a data base useful in regional planning and in the development of management programs as required by the Coastal Zone Management Act of 1972. It also will aid local fishing industries by augmenting currently available hydrologic and navigation charts. The interpretation of geologic and vegetation features resulted in preparation of improved surficial geology, vegetation, and permafrost terrain maps at a scale of 1:1 million utilizing ERTS-1 Band 7 imagery. The maps will be used in a route and site selection study for the Nome to Kobuk Road in central Alaska. Large river icings along the proposed Alaska pipeline route have been monitored. Sea ice deformation and drift northeast of Point Barrow, Alaska, has been measured during a four-day period in March and shorefast ice accumulation, and ablation along the west coast of Alaska is being mapped for the spring and early summer seasons. These data will be used for route and site selection, regional environmental analysis, identification and inventory of natural resources, land use planning, and in land use regulation and management. (See also W76-02026) (Sims-ISWS)
W76-02049

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N. Y.
E. Yost, R. Hollman, J. Alexander, and R. Nuzzi.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1607-1618, 1974. 12 fig, 1 tab, 1 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Estuaries, *New York, Coasts, Sampling, Water quality, Suspended solids, Sediments, Density, Turbidity, Chlorophyll, Data processing, Analytical techniques, Regression analysis, Oceanography
Identifiers: *ERTS, *Block Island Sound(NY), *New York Bight, Extinction coefficient.

ERTS-1 photographic data products have been analyzed using additive color viewing and electronic image analysis techniques. Satellite data were compared to water sample data collected simultaneously with the data of ERTS-1 coverage in New York Bight. Prediction of the absolute value of total suspended particles can be made using composites of positive of MSS bands 5 and 6 which have been precisely made using the step wedge supplied on the imagery. Predictions of the relative value of the extinction coefficient can be made using bands 4 and 5. Thematic charts of total suspended particles (particles per litre) and extinction coefficient provide scientists conducting state and federal water sampling programs in New York Bight with data which improves the performance of these programs. (See also W76-02026) (Sims-ISWS)
W76-02050

AIRCRAFT AND SATELLITE MONITORING OF WATER QUALITY IN LAKE SUPERIOR NEAR DULUTH,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W76-02051

QUANTITATIVE WATER QUALITY WITH ERTS-1,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5A.
W76-02052

TECHNIQUES FOR COMPUTER-AIDED ANALYSIS OF ERTS-1 DATA, USEFUL IN GEOLOGIC, FOREST AND WATER RESOURCE SURVEYS,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7C.
W76-02053

MULTISPECTRAL COMBINATION AND DISPLAY OF ERTS-1 DATA,
California Univ., Davis. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7C.
W76-02054

AFFINE TRANSFORMATIONS FROM A PHOTOS TO COMPUTER COMPA TAPES,
Canada Centre for Remote Sensing, (Ontario).
For primary bibliographic entry see Field 7
W76-02055

ESIAC: A DATA PRODUCTS SYSTEM ERTS IMAGERY (TIME-LAPSE VIEWIN MEASURING),
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 7
W76-02056

ADVANCED PROCESSING AND INFO TION EXTRACTING TECHNIQUES AI TO ERTS-1 MSS DATA,
Environmental Research Inst. of Michiga Arbor.
For primary bibliographic entry see Field 7
W76-02057

INTERPRETATION OF ERTS-1 IMA AIDED BY PHOTOGRAPHIC ENHANCE
Canadian Forestry Service, Ottawa, (Ontar
For primary bibliographic entry see Field 7
W76-02058

A TECHNIQUE FOR CORRECTING DATA FOR SOLAR AND ATMOSPHER FECTS,
Bendix Aerospace Systems Div., Ann Mich.
For primary bibliographic entry see Field 7
W76-02059

THE PENN STATE ORSER SYSTEM PROCESSING AND ANALYZING ERTS D
Pennsylvania State Univ., University Park for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 7
W76-02060

ERTS IMAGE DATA COMPRE TECHNIQUE EVALUATION,
TRW Systems Group, Redondo Beach, Cal
For primary bibliographic entry see Field 7
W76-02061

EVALUATION OF DIGITALLY CORR ERTS IMAGES,
TRW Systems Group, Redondo Beach, Cal
For primary bibliographic entry see Field 7
W76-02062

AUTOMATED THEMATIC MAPPING CHANGE DETECTION OF ERTS-1 IMAG
Itek Corp., Lexington, Mass. Optical Syste
N. Gramenopoulos.
In: Third Earth Resources Technology Sat Symposium, Volume 1: Technical Present Section B. NASA SP-351, Proceedings o posium held December 10-14, 1973, Wash D.C., p 1845-2875, 1974. 13 fig, 6 tab, 6 ref.

Descriptors: *Satellites(Artificial), *R sensing, *Data processing, *An techniques, Land use, Terrain analysis, Ma Digital computers, Computer programs, A tion.
Identifiers: *ERTS, Image processing, Th mapping.

Results of an automated thematic mapp vestigation using ERTS-1 MSS images presented. A diffraction pattern analysis o images led to the development of spatial sig for farm land, urban areas, and mountains spatial features were employed to descri

l characteristics of image cells in the digital Three spectral features were combined with patial features to form a seven-dimensional r describing each cell. Then, the classifica- f the feature vectors was accomplished by the maximum likelihood criterion. Three S-1 images from the Phoenix, Arizona, area processed, and recognition rates between and 100% were obtained for the terrian s of desert, farms, mountains and urban Through the developed algorithms, it was le to automatically recognize terrain types. ing the maximum likelihood criterion, it was le to achieve high accuracy in the recogni- rocess. When the correct statistics are em- d, the machine recognition appears to be accurate than a human photointerpreter who een constrained to use ERTS-1 color com- s only. Stated another way, machine recog- appears to be more sensitive and can te much closer to the resolution limit of the S-1 imagery than the human photointerpreter. esults of the investigation are applicable to roduction of land-use maps. (See also W76-) (Sims-ISWS)
02063

ICATION OF ERTS DATA TO RESOURCE EYS OF ALASKA,
a Univ. College.
rimary bibliographic entry see Field 7C.
02065

E CORRECTION (PRECISION ESSING) OF ERTS SENSOR DATA USING TAL IMAGE PROCESSING TECHNIQUES,
Federal Systems Div., Gaithersburg, Md.
rimary bibliographic entry see Field 7C.
02066

TRAL AND TEXTURAL PROCESSING OF IMAGERY,
s Univ./Center for Research, Inc., nce.
rimary bibliographic entry see Field 7C.
02067

TAL IMAGE ENHANCEMENT NIQUES USED IN SOME ERTS APPLICA- PROBLEMS,
opulsion Lab., Pasadena, Calif.
rimary bibliographic entry see Field 7C.
02068

OTE-SENSING TECHNIQUES FOR RMINING WATER TABLE DEPTHS IN GATED AGRICULTURE,
Lidster, F. A. Schmer, D. W. Ryland, and Moore.
apers from the Fall Convention, American y of Photogrammetry, October 26-31, 1975, Church, Virginia, p 821-838, (1975). 2 fig, 9 ref.

iptors: *Remote sensing, *Water table, ated land, *Aerial photography, *Water Drains, Irrigation systems, Hydrologic Land management, Terrain analysis, Data tions, *Kansas, Agriculture, Irrigation, ge systems, Surveys, Regression analysis. fiers: LANDSAT-1.

s are described to evaluate the applicability mote sensing for determination of water as an aid in the detection of internal ge problems related to irrigation in an ir- d region in North-Central Kansas. Aerial ere collected by LANDSAT-1 and aircraft he Kansas/Bostwick Irrigation District in lic and Jewell Counties, Kansas (an are of imately 400 sq km). Significant correlations obtained between water table depths and SAT-1 and aircraft data for the total area of study and for specific fields. Analysis of a corn field resulted in the correct classification of91 percent of the water tables into depths less than 183 cm and depths greater than 183 cm. Multiple regression equations developed for specific corn fields showed that LANDSAT-1 data for two dates (May and August, 1973) provided a reliable prediction of water table depths. Results were not consistent for aircraft data for specific fields. Significant correlations were obtained for the black and white film exposed with a red filter versus water table depth for 4 of the fields studied. (Robinett-Arizona)
W76-02160

LARGE SCALE COLOR PHOTOGRAPH FOR EROSION EVALUATIONS ON RANGELAND WATERSHEDS IN THE GREAT BASIN,
Nevada Univ., Reno.
For primary bibliographic entry see Field 2J.
W76-02161

LANDSAT, A SATELLITE SURFACE WATER DIVINING ROD,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W76-02162

LANDSAT-1 IMAGERY IN HYDROLOGIC STUDIES,
Washington Univ., Seattle. Dept. of Civil Engineering.
J. E. Colcord.
In: Papers from the Fall Convention, American Society of Photogrammetry, October 26-31, 1975, Falls Church, Virginia, p 413-436, (1975), 12 fig, 10 tab, 10 ref.

Descriptors: *Remote sensing, *Hydrologic data, *Runoff forecasting, *Watersheds(Basins), *Snow cover, Hydrology Data collections, Climatic data, Surveys, *Washington, Geology, Vegetation, Land use, Groundwater, Water sources, Snowpacks, Snow cover, Runoff, Clouds, Rivers, Urbanization, Meteorology, Cloud cover.
Identifiers: LANDSAT-1 imagery, Snow lines, *Nisqually River Basin(Wash).

The study was done on the Nisqually River Basin situated generally to the southeast of Puget Sound in Western Washington. Using LANDSAT-1 images, it was possible to gather data on general geology, land-use and vegetation parameters, groundwater sources, seasonal snow lines and snow pack, algae, and sediment patterns. Land-use classifications for level 1 (urban and built-up) was compared to recent U.S. Geological Surveys maps and the resulting data are presented in runoff change estimation for preliminary engineering design. For the study using LANDSAT-1 imagery (1:1,000,000) in MSS bands 4, 5, 6, and 7, the following were identified as items of concern: watershed determination and related studies; river characteristics; land-use characteristics; and atmospheric characteristics. The major problems encountered with imagery uses for engineering studies are: delay in obtaining coverage; cloud frequency expectation; vegetation cover; and shadow in vegetation and snow in areas of high relief and scale. However, the multi-data imagery is helpful in snow line variation and in changes in runoff prediction. (Robinett-Arizona)
W76-02163

FLOOD PLAIN MAPPING: PHOTOGRAMMETRIC DATA FOR HYDROLOGY,
Hurd (Mark) Aerial Surveys, Inc., Minneapolis, Minn.
For primary bibliographic entry see Field 7C.
W76-02164

REMOTE SENSING AS AN AID TO COMMUNITY DEVELOPMENT IN AN ARID AREA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
K. E. Foster, and R. N. Weisz.
In: Papers from the Fall Convention, American Society of Photogrammetry, October 26-31, 1975, Falls Church, Virginia, p 856-875, (1975), 12 fig, 6 tab.

Descriptors: *Remote sensing, *Hydrologic data, *Mapping, *Arid lands, *Planning, *Land management, *Computer programs, Photography, Aerial photography, Flood plain zoning, Maps, Surveys, Flood protection, Flood control, Hydrology, Flood plains, Terrain analysis, Watersheds(Basins), Data collections, Arizona, Water sources, Computers, Data processing, Land development, Land use, Vegetation, Topography, Water supply, Groundwater recharge, Natural resources, Semiarid climates, Urbanization.
Identifiers: *High-altitude infrared photography, Vegetation distribution, Soils distribution, Tucson(Ariz).

The objective was to improve the staff decision-making base by utilizing remotely sensed data to aid in the land-planning process for an approximate 70,000-acre site north of Tucson, Arizona. NASA high-altitude color infrared photography of the area was enlarged to a scale of 1:31,680 (2 inch equals 1 mile). Laboratory mapping and field work were combined to produce 5 natural resource maps of the area including existing land use, vegetation distribution, slope, groundwater recharge zones, and soils distribution maps. These 5 maps were digitized and entered into a computer program to overlay multiple maps which allowed evaluation of the combined environmental effects of the mapped resources simultaneously for urban development suitability. The suitability criteria were based on new construction starts on soil types free of flooding potential, slopes less than 5 percent, urban areas located in nonunique vegetation types, and sufficient water available for human consumption. (Robinett-Arizona)
W76-02165

APPLICATION OF REMOTE SENSING IN FLOODWAY DELINEATION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
R. B. Clark.
In: Vol 4: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1974 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 19-20, 1974, Flagstaff, Arizona, p 300-308, 1 fig, 2 tab, 6 ref.

Descriptors: *Remote sensing, *Flood plain zoning, *Flood protection, *Arizona, *Aerial photography, Regulation, Flood plains, Geomorphology, Flood data, Maximum probable flood, Instrumentation, Mapping, Surveys, Soils, Soil types, Vegetation, Hydrologic data, Historic floods, Soil horizons.
Identifiers: Cochise County(Ariz), Earth Resource Technology Satellite(ERTS-1).

Population pressures on the land resources of Arizona have led to the sale and development of areas subject to flooding and because of the inadequacy of land use controls, the area is open to various land speculation schemes and unplanned subdivision growth. A floodplain delineation project was conducted for the Planning Department of Cochise County, Arizona, in which imagery acquired by Earth Resources Technology Satellite (ERT-1) and by high-altitude aircraft was employed. Parameters of the analysis included soils and geomorphology, vegetation, hydrologic calculations, and historical data. Floodplain soils lack developed B horizons, as compared to older, more mature soils not subject to flooding. General soil maps can only be used as guidelines, but a detailed

soil survey can add significantly to the accuracy of image interpretations. Erosion-affected soil tones in areas adjacent to active channels proved beneficial in that the heightened contrast served to enhance resolution of vegetation-type boundaries. Hydrologic calculations were done based on valley cross-sections surveyed at two-to-three mile intervals. The historic data input into the system of floodplain delineation is dependent on the location of high-water marks and on obtaining a record of the amount of rainfall which resulted in the high-water mark. (Robinett-Arizona)
W76-02244

ELECTRONIC WATER LEVEL INDICATOR,
Universal Oil Products Co., Des Plaines, Ill. (assignee).
R. S. Markfelt.
U. S. Patent No 3,909,948, 3 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 939, No 1, p 46, October 7, 1975.

Descriptors: *Patents, *Water levels, *Water wells, *Measurement, Highwater mark, Electronic equipment, Instrumentation.
Identifiers: *Water level indicators.

A lightweight, portable electronic water level indicator utilizes a probe with vertically spaced contacts attached to a 2 conductor light gauge cable. The cable is wrapped around a flanged storage hub which has winding handles on each side. A simple electronic circuit is switched on by the presence of water between the probe contacts to control a signal device such as a light bulb. The circuitry, the signal device such as a light bulb. The circuitry, the signal device and the two AA size batteries that provide the power are all carried within the relatively small diameter hub. In use, the cable is unwound into a water well until the light goes on. One of the footage markers located at spaced intervals along the cable can then be observed to determine the depth location of the water in the well. (Sinha-OEIS)
W76-02246

WATER TESTING DEVICE,
For primary bibliographic entry see Field 5A.
W76-02250

A PHOTOGRAPHIC TECHNIQUE FOR MONITORING EROSION ON STRIP MINED LANDS,
Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 5A.
W76-02278

REMOTE SENSING OF WATER QUALITY IN PRAIRIE LAKES,
South Dakota State Univ., Brookings. Dept. of Botany and Biology.
For primary bibliographic entry see Field 5A.
W76-02363

THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOL. V. INLAND WATER RESOURCES.
ECON, Inc., Princeton, N.J.
For primary bibliographic entry see Field 6B.
W76-02382

APPLICATION OF REMOTE SENSING FOR PREDICTION AND DETECTION OF THERMAL POLLUTION,
Miami Univ., Coral Gables, Fla. Inst. of Clean Energy Research.
For primary bibliographic entry see Field 5A.
W76-02393

MEASUREMENT OF SWASH PROFILE AND ORBITAL MOTION ON THE BEACH,
Tetra Tech Inc., Pasadena, Calif.
For primary bibliographic entry see Field 2I
W76-02394

INSTRUMENTAL ANALYSIS OF CHEMICAL POLLUTANTS, TRAINING MANUAL,
Environmental Protection Agency, Cincinnati, Ohio. Municipal Permits and Operations Div.
For primary bibliographic entry see Field 5A
W76-02395

DEVELOPMENT OF A SHALLOW-WATER WAVE DIRECTION GAGE,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W76-02399

RESULTS FROM THE CERC WAVE MEASUREMENT PROGRAM,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W76-02400

HORIZONTAL TURBULENT ENERGY TRANSFER ASSOCIATED WITH A GREAT LAKES COASTAL CURRENT,
Wisconsin Univ., Madison. Marine Studies Center.
For primary bibliographic entry see Field 2H.
W76-02411

MEASUREMENT OF THE APPARENT PH OF SEAWATER WITH A COMBINATION MICROELECTRODE,
Naval Undersea Center, San Diego, Calif. Div. of Chemistry and Environmental Sciences.
For primary bibliographic entry see Field 2L.
W76-02415

LOSS OF P32-PHOSPHATE AND C14-CARBONATE ACTIVITY DURING LIQUID SCINTILLATION COUNTING OF AQUEOUS SAMPLES,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5A.
W76-02417

OPTIMIZING RAINFALL ESTIMATES WITH THE AID OF RADAR,
National Severe Storms Lab., Norman, Okla.
For primary bibliographic entry see Field 2B.
W76-02423

USE OF AREAL SNOW COVER MEASUREMENTS TO DEVELOP SNOWMELT-RUNOFF RELATIONSHIPS FOR ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W76-02453

AN IMPROVED METHOD OF SILICON-32 MEASUREMENT OF GROUNDWATERS,
Physical Research Lab., Ahmedabad (India).
For primary bibliographic entry see Field 4B.
W76-02455

STRATIFIED SAMPLING OF SOIL MOISTURE,
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2G.
W76-02457

7C. Evaluation, Processing and Publication

A LAND CAPABILITY MODEL FOR LOWER LAKE MONROE WATERSHED,
Indiana Univ., Bloomington. Water Res Research Center
For primary bibliographic entry see Field 4A
W76-02002

THIRD EARTH RESOURCES TECHNO SATELLITE-1 SYMPOSIUM. VOLUM TECHNICAL PRESENTATIONS, SECTIO
National Aeronautics and Space Administ Washington, D.C., Scientific and Technical mation Div
For primary bibliographic entry see Field 7E
W76-02026

ERTS-1 DATA IN SUPPORT OF TH TIONAL PROGRAM OF INSPECTIO DAMS,
National Aeronautics and Space Admin Houston, Tex. Lyndon B. Johnson Space C
G. E. Graybeal, F. G. Hall, B. H. Moore, an Schlosser.
In: Third Earth Resources Technology Sa Symposium, Volume 1: Technical Present Section B. NASA SP-351, Proceedings o posium held December 10-14, 1973, Wash D.C., p 1023-1039, 1974. 5 fig, 2 tab, 7 ref.

Descriptors: *Satellites(Artificial), * sensing, *Dams, *Data processing, *Texa veys, Surface waters, Bodies of water, Da lections, Inspection, Mapping, An techniques, Computers, Automation.
Identifiers: *ERTS, Dam inspection.

The National Aeronautics and Space Adm tion's role in the national Earth Resources Program emphasizes the development and t of remote sensing technology to operatio ganizations such as federal agencies, or st local governments. Within the scope of thi a computer-aided procedure, for use in the tion and location of areas of surface wat been developed by the Earth Observation sion in the Science and Applications Direct the Lyndon B. Johnson Space Center, H Texas. The procedure was developed in sup the National Program of Inspection of established by Public Law 92-367. The pr utilized data acquired by the unmanned Resources Technology Satellite (ERTS-1) junction with ancillary data in the form o graphic and highway maps, and meteor data summaries. The procedure is divid several distinct phases. A five-volume man been prepared to instruct potential users procedure. (See also W76-02026) (Sims-ISW
W76-02029

DYNAMICS OF PLAYA LAKES IN THE HIGH PLAINS,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 7I
W76-02030

MEASURING WATERSHED RUNOFF BILITY WITH ERTS DATA,
Agricultural Research Service, Chickasha,
B. J. Blanchard.
In: Third Earth Resources Technology Sa Symposium, Volume 1: Technical Present Section B, NASA SP-351, Proceedings o posium held December 10-14, 1973, Wash D.C., p 1089-1098, 1974. 5 fig, 1 ref.

Descriptors: *Satellites(Artificial), * sensing, *Runoff, *Reservoir design, *Okl Data processing, Analytical techniques,

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n analysis, Dams, Design criteria, Water
ply, Impoundments, Surface waters,
tersheds(Basins), Salinity.
ntifiers: *ERTS.

ameters of most equations used to predict ru-
f from an ungaged area are based on charac-
stics of the watershed and subject to the biases
a hydrologist. Digital multispectral scanner
SS) data from ERTS was reduced with the aid
computer programs and a Dicomed display.
ltivariate analyses of the MSS data indicated
discrimination between watersheds with dif-
nt runoff capabilities is possible using ERTS
. Differences between two visible bands of
S data can be used to more accurately evaluate
parameters than present subjective methods,
s reducing construction cost due to overdesign
flood detention structures. (See also W76-
26) (Sims-ISWS)
6-02031

**TRANSMISSION OF WATER RESOURCES
TA USING THE ERTS-1 DATA COLLEC-
N SYSTEM,**
partment of the Environment, Ottawa
tario).
primary bibliographic entry see Field 7B.
6-02032

**TS-1 FLOOD HAZARD STUDIES IN THE
SSISSIPPI RIVER BASIN,**
ional Aeronautics and Space Administration,
enbelt, Md. Goddard Space Flight Center.
primary bibliographic entry see Field 7B.
6-02033

**REAL TIME DATA ACQUISITION SYSTEM
SATELLITE RELAY,**
ps of Engineers, Walthan, Mass. New England

primary bibliographic entry see Field 7B.
6-02035

**PLICATIONS OF ERTS DATA TO COASTAL
TLAND ECOLOGY WITH SPECIAL
FERENCE TO PLANT COMMUNITY
PPING AND TYPING AND IMPACT OF
N,**
erican Univ., Washington, D.C., Dept. of
iogy.
primary bibliographic entry see Field 7B.
6-02036

**ENTORIES OF DELAWARE'S COASTAL
GETATION AND LAND-USE UTILIZING
ITAL PROCESSING OF ERTS-1 IMAGERY,**
aware Univ., Newark. Coll. of Marine Studies.
primary bibliographic entry see Field 7B.
6-02037

**ALUATION OF REMOTE SENSING AND
TOMATIC DATA TECHNIQUES FOR
ARACTERIZATION OF WETLANDS,**
ional Aeronautics and Space Administration,
Saint Louis, Miss. Earth Resources Lab.
I. Cartmill.
Third Earth Resources Technology Satellite-1
posium, Volume 1: Technical Presentations,
tion B, NASA SP-351, Proceedings of Sym-
um held December 10-14, 1973, Washington,
., p 1257-1277, 1974. 12 fig, 5 tab, 2 ref.

criptors: *Satellites(Artificial), *Remote
sing, *Wetlands, *Louisiana, Data processing,
lytical techniques, Vegetation, Trees, Classifi-
on, Plant groupings, Surface waters, Rivers,
er basins, Marshes, Lakes, Coasts, Forestry,
al photography.
ntifiers: *ERTS, *Atchafalaya River basin(La).

An evaluation was conducted in the Atchafalaya River basin of South Central Louisiana, a humid area of heavily forested swamps with a large volume of flow mostly from a diversion of the lower Mississippi River. Techniques to obtain enlarged imagery from computer compatible tapes of ERTS data without photographic enlargement were explained and illustrated. Techniques of extraction of environmental information from single bands and multiband pattern recognition procedures were explained and evaluated. A comparison of pattern recognition classifications of the Atchafalaya basin by aircraft multispectral scanner and ERTS MSS data was made. Data for the comparison were gathered within three weeks of each other in the winter of 1973. Scorecards of the accuracy of the classifications were presented. Recommendations were made concerning the utilization of each sensor platform to perform specific tasks of wetlands characterization. (See also W76-02026) (Sims-ISWS)
W76-02038

RELATIONSHIPS BETWEEN ERTS RADIANCES AND GRADIENTS ACROSS OCEANIC FRONTS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
For primary bibliographic entry see Field 7B.
W76-02039

OCEAN INTERNAL WAVES OFF THE NORTH AMERICAN AND AFRICAN COASTS FROM ERTS-1,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
For primary bibliographic entry see Field 7B.
W76-02040

A REVIEW OF INITIAL INVESTIGATIONS TO UTILIZE ERTS-1 DATA IN DETERMINING THE AVAILABILITY AND DISTRIBUTION OF LIVING MARINE RESOURCES,
National Marine Fisheries Service, Bay Saint Louis, Miss. Fisheries Engineering Lab.
For primary bibliographic entry see Field 7B.
W76-02041

SEDIMENT CONCENTRATION MAPPING IN TIDAL ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 7B.
W76-02043

MONITORING COASTAL WATER PROPERTIES AND CURRENT CIRCULATION WITH ERTS-1,
Delaware Univ., Newark.
For primary bibliographic entry see Field 7B.
W76-02044

CALIFORNIA COASTAL PROCESSES STUDY,
Corps of Engineers, San Francisco, Calif. South Pacific Div.
For primary bibliographic entry see Field 7B.
W76-02045

THE UTILIZATION OF ERTS-1 DATA FOR THE STUDY OF THE FRENCH ATLANTIC LITTORAL,
Institut Geographique National, Paris (France).
For primary bibliographic entry see Field 7B.
W76-02046

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N. Y.
For primary bibliographic entry see Field 7B.
W76-02050

TECHNIQUES FOR COMPUTER-AIDED ANALYSIS OF ERTS-1 DATA, USEFUL IN GEOLOGIC, FOREST AND WATER RESOURCE SURVEYS,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
R. M. Hoffer.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section, B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1687-1708, 1974, 14 fig, 4 tab, 5 ref. NASA NAS5-21880, NGL 15-005-112.

Descriptors: *Satellites(Artificial), *Remote sensing, *Analytical techniques, *Data processing, Computers, Computer programs, Geology, Geomorphology, Mountains, Snow cover, Snowmelt, Cloud cover, Water resources, Lakes, Forests, Mapping.
Identifiers: *ERTS.

Forestry, geology, and water resource applications were the focus of a study, involving the use of computer-implemented pattern-recognition techniques to analyze ERTS-1 data. Several analysis capabilities have been developed during the ERTS-1 investigations. A procedure to rotate, deskew, and geometrically scale the MSS data resulted in 1:24,000 scale printouts that can be directly overlayed on 7 1/2 minute U.S.G.S. topographic maps. Several scales of computer-enhanced 'false color-infrared' composites of MSS data could be obtained from a digital display unit, and emphasized the tremendous detail present in the ERTS-1 data. A grid could also be superimposed on the displayed data to aid in specifying areas of interest, such as avalanche tracks or areas of burned-over timberland. Temporal overlays of six sets of data allowed both qualitative and quantitative analysis of changes in the areal extent of the snowpack. Computer-aided analysis of the data allowed one to obtain both cover-type maps and tables showing acreage of the various cover types, even for areas having irregular boundaries, such as individual watersheds. (See also W76-02026) (Sims-ISWS)
W76-02053

MULTISPECTRAL COMBINATION AND DISPLAY OF ERTS-1 DATA,
California Univ., Davis. Dept. of Electrical Engineering.
V. R. Algazi.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1709-1717, 1974, 2 fig, 4 tab, 6 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Analytical techniques, Data processing, Mapping, Color, Land, Surface waters, Clouds.
Identifiers: *ERTS, Data displays, Dimensionality reduction, Principal components analysis, Multispectral sensor data.

Standard NASA color composites combine the most relevant 3 bands from the 4 MSS bands available. An alternate approach is to extract the principal components of the data by a linear transformation of the 4 bands. This approach leads to a low dimensionality representation of ERTS-1 data with the least degradation, in the mean square sense, of the radiometric accuracy. The technique has been applied with success to ERTS-1 MSS data for several geographic areas in California. For all examples considered, the mean square representation error was less than one percent. By combining this dimensionality reduction with our

previous results on image enhancement for visual display, color composites were obtained which contained and displayed most of the information provided by the ERTS-1 sensors. (See also W76-02026) (Sims-ISWS)
W76-02054

AFFINE TRANSFORMATIONS FROM AERIAL PHOTOS TO COMPUTER COMPATIBLE TAPES,
Canada Centre for Remote Sensing, Ottawa (Ontario).
F. G. Peet, A. R. Mack, and L. S. Crosson.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., ; 1719-1724, 1974. 4 fig.

Descriptors: *Satellites(Artificial), *Remote sensing, *Analytical techniques, Aerial photography, Data processing, Field crops, Wheat, Mapping, Computers.
Identifiers: *ERTS, Image transformations, Data displays, Geometric corrections.

During the development of a project to estimate wheat production, it became necessary to pull data, corresponding to particular fields in a test site, off an ERTS computer-compatible tape. Aerial photographs and topographic maps were on hand for the test site. A method was devised, using an affine transformation, to relate the aerial photographs or topographic maps to the tapes. One can thereby access data on the tape corresponding to regions covered by only a few pixels. The theory can be used for the registration of two tapes for the same area and for 'geometric correction' of images. (See also W76-02026) (Sims-ISWS)
W76-02055

ESIAC: A DATA PRODUCTS SYSTEM FOR ERTS IMAGERY (TIME-LAPSE VIEWING AND MEASURING),
Stanford Research Inst., Menlo Park. Calif.
W. E. Evans, and S. M. Serebreny.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1725-1741, 1974. 9 fig, 1 ref. NASA NAS5-21841.

Descriptors: *Satellites(Artificial, *Remote sensing, *Analytical techniques, Equipment, Data processing, Mapping, Maps, Data storage and retrieval, Computers.
Identifiers: *ERTS, Data displays.

An Electronic Satellite Image Analysis Console (ESIAC) has been developed for visual analysis and objective measurement of Earth Resources Imagery. The system is being employed to process imagery for use by USGS investigators in several different disciplines studying dynamic hydrologic conditions. The ESIAC provides facilities for storing registered image sequences in a magnetic video disc memory for subsequent recall, enhancement, and animated display in monochrome or color. The unique feature of the system is the capability to time-lapse the ERTS imagery and/or analytic displays of the imagery. Data products have included quantitative measurements of distances and areas, brightness profiles, and movie loops of selected themes. The applications of these data products were identified and include such diverse problem areas as measurement of snowfield extent, sediment plumes from estuary discharge, playa inventory, and phreatophyte and other vegetation changes. A comparative ranking of the electronic system in terms of accuracy, cost effectiveness, and data output showed it to be a viable means of data analysis. (See also W76-02026) (Sims-ISWS)
W76-02056

ADVANCED PROCESSING AND INFORMATION EXTRACTING TECHNIQUES APPLIED TO ERTS-1 MSS DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
M. A. Malila, and R. F. Nalepka.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1743-1772, 1974. 14 fig, 2 tab, 14 ref. NASA NAS9-9784.

Descriptors: *Satellites(Artificial), *Remote sensing, *Data processing, *Analytical techniques, Data storage and retrieval, Maps, Aerial photography, Computers, Surface waters, Vegetation, Mapping, Land use.
Identifiers: *ERTS.

Conventional automatic data processing and information extraction techniques fall short of providing the information required by the user in some applications. For those cases, advanced techniques are needed to permit the extraction of the necessary information. Advanced techniques that have been developed were described, examples of their application to ERTS-1 MSS data were provided. The techniques described were designed to help overcome problems in location, mensuration, and classification accuracies which result from geometric distortions of the ERTS MSS data, the relatively coarse resolution of the sensor, and variations in atmospheric state over the region to be surveyed. It was shown that each of these factors can seriously degrade the ability to extract necessary information. Further, it was shown that advanced techniques can alleviate the effects of these factors.(See also W76-02026) (Sims-ISWS)
W76-02057

INTERPRETATION OF ERTS-1 IMAGERY AIDED BY PHOTOGRAPHIC ENHANCEMENT,
Canadian Forestry Service, Ottawa, (Ontario).
U. Nielsen.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1773-1786, 1974. 11 fig.

Descriptors: *Satellites(Artificial), *Remote sensing, *Analytical techniques, *Data processing, Photography, Surface waters, Rivers, Lakes, Forests, Data storage and retrieval.
Identifiers: *ERTS, Photographic enhancement.

Agfacontour film can be used to produce relatively economical enhancements of density differences recorded on film. Image interpreters often ask whether enhancement really increases the information content of the original images. Examples of ERTS-1 imagery enhancements show that it is possible to separate density levels which are not discernible by the human eye. It is stressed that these techniques do not replace the photo interpreter, but rather they aid him in the interpretation process. Subtle density variations are made to stand out and an objective classification of the densities forming the image is produced. (See also W76-02026) (Sims-ISWS)
W76-02058

A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers, K. Peacock, and N. J. Shah.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1787-1804, 1974. 10 fig, 3 tab, 8 ref.

Descriptors: *Satellites(Artificial), *R sensing, *Data processing, Solar radiatio bedo, Atmosphere, Instrumentation, An techniques, Computers, Surveys, Refle Data collections
Identifiers: *ERTS.

A technique was described by which ER vestigators can obtain and utilize solar a mospheric parameters to transform spa radiance measurements to absolute reflectance signatures. A radiant power me instrument and its use in determining atmo parameters needed for ground truth discussed. The procedures used and achieved in processing ERTS computer co ble tapes to correct for atmospheric parame obtain imagery were reviewed. Example given which demonstrate the nature an nitude of atmospheric effects on compute sification programs. (See also W76-02026) ISWS)
W76-02059

THE PENN STATE ORSER SYSTEM PROCESSING AND ANALYZING ERTS D
Pennsylvania State Univ., University Park. for Remote Sensing of Earth Resources.
G. J. McMurtry, F. Y. Borden, H. A. Weede G. W. Petersen.
In: Third Earth Resources Technology Sat Symposium, Volume 1: Technical Present Section B. NASA SP-351, Proceedings o posium held December 10-14, 1973, Wash D.C., p 1805-1822, 1974. 9 fig, 1 tab.

Descriptors: *Satellites(Artificial), *I sensing, *Data processing, Calibrations, Ma Computer programs, Digital computers, mines, Vegetation, Forestry, Surveys, Da lections, Analytical techniques.
Identifiers: *ERTS.

The Office for Remote Sensing of Resources (ORSER) of the Space Science a gineering Laboratory at Pennsylvania University has developed an extensive oper system for processing and analyzing ERTS similar multispectral data. The ORSER was developed for use by a wide vari researchers working in remote sensing, photointerpretive techniques and automati puter processing methods have been dev and used, separately and in a combined app Detector errors occuring in two channels of sixth line of ERTS digital data were examine a statistical recalibration method was deve Errors were eliminated after recalibration. recalibration of data from two ERTS scenes sification of a forested area yielded ex results using spectral signatures develop another area approximately 150 miles awa from an ERTS scene taken 17 days earlier. transference of signatures in both time and appears feasible. Specific results, obtain using this system included a study of land us crimination between types of forest resourc vegetation, detection of previously unk geologic faults and correlation of these known mineral deposits and ground mapping of mine spoils in the anthracite reg eastern Pennsylvania, mapping of strip min acid mine drainage in central Pennsyl agricultural land use mapping, and detect gypsy moth infestation. (See also W76- (Sims-ISWS)
W76-02060

ERTS IMAGE DATA COMPRES TECHNIQUE EVALUATION,
TRW Systems Group, Redondo Beach, Calif
C. L. May.
In: Third Earth Resources Technology Sate Symposium, Volume 1: Technical Presenta Section B. NASA SP-351, Proceedings of posium held December 10-14, 1973, Washi D.C., p 1823-1835, 1974. 4 fig, 1 tab, 2 ref.

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riptors: *Satellites(Artificial), *Remote ing, *Data processing, Computer programs, al computers, Mapping, Data collection, Data ge and retrieval, Analytical techniques.
tifiers: *ERTS, Data compression techniques.

background and results of an investigation of ispectral data compression in the ERTS pro- was presented. An average compression of ter than 2:1 has been achieved under the con- nt of zero distortion in the reconstructed e, and four MSS tapes can be compressed to ss than one reel of magnetic tape. A prelimi- study of the hardware implementation of this essor proved the feasability of compression at bit rates of over 100 Megabits/second. (See W76-02026) (Sims-ISWS)
-02061

LUATION OF DIGITALLY CORRECTED S IMAGES,
/ Systems Group, Redondo Beach, Calif.
Taber.
Third Earth Resources Technology Satellite-1 posium, Volume 1: Technical Presentations, ion B. NASA SP-351, Proceedings of Sym- um held December 10-14, 1973, Washington, , p 1837-1843. 8 fig.

riptors: *Satellites(Artificial), *Remote ing, *Data processing, *Analytical niques, Digital computers, Sampling, Evalua-

tifiers: *ERTS, *Interpolation techniques, ge processing, Cubic convolution.

ew of almost any uncorrected photograph con- ted from ERTS MSS data provides a striking mple of a small section of the earth as seen space. Such images, beautiful as they are to eye, however, contain errors that limit their ulness where mensuration, precise location or temporal registration are required. The ission here was limited to processes by which of data samples collected on a geometrically rted grid can be converted to samples on a rent precisely specified grid. The resampling niques evaluated have included nearest hbor, bilinear, cubic convolution, and various cated versions of sinc (x). The conclusion was cubic convolution yields substantially higher ity output data for scenes typically encoun- d and can, in some instances, substantially nce ability to abstract information. (See also -02026) (Sims-ISWS)
-02062

OMATED THEMATIC MAPPING AND NGE DETECTION OF ERTS-1 IMAGES,
Corp., Lexington, Mass. Optical Systems Div.
primary bibliographic entry see Field 7B.
-02063

NCIPAL COMPONENTS COLOUR DIS- Y OF ERTS IMAGERY,
nse and Civil Inst. of Environmental icine, Downsview (Ontario)
. Taylor.
Third Earth Resources Technology Satellite-1 posium, Volume 1: Technical Presentations, ion B. NASA SP-351, Proceedings of Sym- um held December 10-14, 1973, Washington, , p 1877-1897, 1974. 16 fig, 1 tab, 6 ref.

riptors: *Satellites(Artificial), *Remote ing, *Data processing, *Analytical niques, Color, Mapping, Aerial photography, ogrammetry, Photography.
tifiers: *ERTS, Image processing.

binations of data from the four ERTS bands color images are usually made by selecting bands and displaying each in a different pri- color (red, green, and blue). Because the from the different bands are correlated, there is a tendency for the derived pictures to occupy only a small portion of the available color space. In the most common combination, MSS bands 1 and 2, which are highly correlated, are displayed as blue and green respectively, and band 3 as red. This results in a picture which for most regions might as well have been printed in red and blue-green. In the technique presented, colors were not derived from single bands, but rather from independent linear combinations of the bands. Using a simple model of the processing done by the visual system, three informationally independent linear combinations of the four ERTS bands were mapped onto the three visual color dimensions of brightness, redness-greenness and blueness-yellowness. The technique permitted user-specific transformations which enhance particular features, but this is not usually needed, since a single transformation provided which conveys much of the information implicit in the ERTS data. (See also W76-02026) (Sims-ISWS)
W76-02064

APPLICATION OF ERTS DATA TO RESOURCE SURVEYS OF ALASKA,
Alaska Univ. College.
A. E. Belon, and J. M. Miller.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1899-1907, 1974.

Descriptors: *Satellites(Artificial), *Remote sensing, Facilities, *Alaska, *Analytical techniques, Research facilities, Digital computers, Data processing, Surveys, Resources, Environment, Vegetation, Forestry, Sea ice, Snow, Pollutants, Water pollution.
Identifiers: *ERTS, Image processing.

ERTS data, with its demonstrated capability for economical surveys of large areas, affords a unique opportunity to perform urgently needed resource surveys and land-use planning at a critical juncture in the history of Alaska's social and economic development. A facility for retrieval, processing, and interpreting of ERTS data and aircraft remote sensing data has been established at the University of Alaska. This facility is widely utilized by twelve University ERTS projects and many agencies, public and private, to produce the needed environmental surveys in strategic regions of Alaska. The available facilities for photographic, optical, and digital processing of ERTS data were described, along with the interpretive techniques which have been developed. Examples of the applications of these facilities and techniques were given for three environmental disciplines: vegetation mapping for potential archeological sites; marine and sea-ice surveys on the Alaskan continental shelf for the determination of surface circulation and sedimentation patterns and their effects on navigation, pollution assessment, fisheries, location of harbors, and construction of offshore structures; and snow surveys for inventories of water resources and flood potential in Alaska watersheds. (See also W76-02026) (Sims- ISWS)
W76-02065

SCENE CORRECTION (PRECISION PROCESSING) OF ERTS SENSOR DATA USING DIGITAL IMAGE PROCESSING TECHNIQUES,
IBM Federal Systems Div., Gaithersburg, Md.
R. Berstein.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1909-1928, 1974. 18 fig, 6 tab, 6 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Analytical techniques, *Data processing, Computers, Digital computers, Mapping, Facilities.
Identifiers: *ERTS, Image processing, Geometric corrections.

Techniques were developed, implemented, and evaluated to process ERTS Return Beam Vidicon (RBV) and Multispectral Scanner (MSS) sensor data using digital image processing techniques. The RBV radiometry was corrected to remove shading effects, and the MSS geometry and radiometry was corrected to remove internal and external radiometric and geometric errors. General purpose and special purpose computer configurations to process the data in a production mode were defined and their throughputs investigated. The results showed that geometric mapping accuracy of about one picture element RMS and two picture elements (maximum) can be achieved by the use of nine ground control points. Radiometric correction of MSS and RBV sensor data was performed to eliminate striping and shading effects to about one count accuracy. Image processing times on general purpose computers of the IBM 370/145 to 168 class were in the range of 29 to 3.2 minutes per MSS scene (4 bands). Photographic images of the fully corrected and annotated scenes were generated from the processed data and have demonstrated excellent quality and information extraction potential. (See also W76-02026) (Sims-ISWS)
W76-02066

SPECTRAL AND TEXTURAL PROCESSING OF ERTS IMAGERY,
Kansas Univ./Center for Research, Inc., Lawrence.
R. M. Haralick, and R. Bosley.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B. NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1929-1969, 1974. 6 fig, 10 tab, 32 ref, 2 append.

Descriptors: *Satellites(Artificial), *Remote sensing, *Data processing, *Analytical techniques, Land use, Classification, Mathematics, Computers, Digital computers, Analysis.
Identifiers: *ERTS, Image processing, Textural processing.

A procedure was developed to simultaneously extract textural features from all bands of ERTS multi-spectral scanner imagery for automatic analysis. Multi-images lead to excessively large grey tone N-tuple co-occurrence matrices; therefore, neighboring grey tone N-tuple differences were measured and an ellipsoidally symmetric functional form was assumed for the co-occurrence distribution of multi-image greytone N-tuple difference. On the basis of past data the ellipsoidally symmetric approximation was shown to be reasonable. Initial evaluation of the procedure was encouraging. (See also W76-02026) (Sims-ISWS)
W76-02067

DIGITAL IMAGE ENHANCEMENT TECHNIQUES USED IN SOME ERTS APPLICATION PROBLEMS,
Jet Propulsion Lab., Pasadena, Calif.
A. F. H. Goetz, and F. C. Billingsley.
In: Third Earth Resources Technology Satellite-1 Symposium, Volume 1: Technical Presentations, Section B NASA SP-351, Proceedings of Symposium held December 10-14, 1973, Washington, D.C., p 1971-1992, 1974. 9 fig, 12 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Data processing, *Analytical techniques, Analysis, Digital computers, Geology, Land use, Oceanography.
Identifiers: *ERTS, Image processing, Image enhancement, Contrast improvement.

Enhancement and classification are not competing methods for machine image analysis. Enhanced images can be used alone or as inputs to classifica-

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tion routines. However, in some problems the spatial relationships are equal in importance to the classification results and enhancements can be designed to provide both types of information in one image. Enhancements discussed include contrast stretching, multiratio color displays, Fourier plane operations to remove striping and boosting modulation transfer function (MTF) response to enhance high spatial frequency content. The use of each technique in a specific application in the fields of geology, geomorphology and oceanography was demonstrated. (See also W76-02026) (Sims-ISWS)
W76-02068

RAINFALL-RUNOFF AS SPATIAL STOCHASTIC PROCESSES: DATA COLLECTION AND SYNTHESIS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 2B.
W76-02069

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 3. OHIO RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Wash, D.C. 20402, price $3.90. Water-Supply Paper 2153, 1975. 444 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Surface water, *Sediment transport, *Water temperature, *Ohio River, River basins, Lakes, Basic data collections, Alabama, Georgia, Indiana, Kentucky, Maryland, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Chemical analysis, Physical properties, Particle size, Inorganic compounds, Biological properties, Streamflow.
Identifiers: *Ohio River basin.

During the water year ending September 30, 1970, the Geological Survey maintained 181 stations on 104 streams in the Ohio River basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 95 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 80 and daily at 63 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 22 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 16 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W76-02132

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 8. WESTERN GULF OF MEXICO BASINS--VOLUME 1. BASINS FROM MERMENTAU RIVER TO COLORADO RIVER.
Geological Survey, Reston, Va.
Available from Supt. of Doc, U.S. Govt. Printing Off, Washington, D.C. Water-Supply Paper 2122, 1975, 1144 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Lakes, River basins, Gulf of Mexico, Louisiana, New Mexico, Texas, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Hydrologic data, Lakes, Reservoirs.
Identifiers: *Western Gulf of Mexico basins, Maximum discharges, Minimum discharges.

This volume is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and content of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Western Gulf of Mexico basins, Mermentau River to Colorado River. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W76-02133

MAP SHOWING THICKNESS OF THE PERMIAN (GUADALUPIAN) CAPTAIN AQUIFER, SOUTHEAST NEW MEXICO AND WEST TEXAS,
Geological Survey, Albuquerque, N. Mex.
W. L. Hiss.
Open-file map, June 1975, 1 sheet, 16 ref.

Descriptors: *Water wells, *Aquifers, *Maps, *New Mexico, *Texas, Groundwater resources, Aquifer characteristics, Petrology, Hydrogeology, Wells, Sites, Mapping, Geomorphology, Oil industry.
Identifiers: *Captain aquifer(N Mex-West Texas).

The Captain aquifer is an important source of the groundwater used for municipal, industrial, and agricultural purposes in the vicinity of Carlsbad, N. Mex. In addition, water pumped from this aquifer in southern Lea County, New Mexico, and Winkler and Ward Counties, Texas, is injected into other reservoirs by oil companies to increase the recovery of petroleum from partially depleted oilfields. A knowledge of the dimensions of the Captain aquifer in southeastern New Mexico and western Texas will be useful in programs designed to manage this important resource. This map, depicting the position and thickness of the Captain aquifer, will also be helpful to petroleum companies who may wish to control lost circulation while penetrating this porous and permeable unit as they explore for oil and gas in underlying strata. The aquifer is generally composed of relatively 'clean' carbonate rock, especially near the fore-reef edge. The locations of nearly 400 wells that have been drilled through the Captain aquifer within the project area, along with corresponding thickness of the aquifer penetrated in each well, are plotted. (Woodard-USGS)
W76-02134

WATER RESOURCES INFORMATION NEEDS FOR THE NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT.
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-02138

GROUND-WATER LEVELS AND WELL RECORDS FOR CURRENT OBSERVATION WELLS IN IDAHO, 1974,
Geological Survey, Boise, Idaho.
H. G. Sisco.
Idaho Department of Water Resources, Boise, Basic Data Release No 2, August 1975, 357 p, 16 fig, 20 ref.

Descriptors: *Observation wells, *Water wells, *Well data, *Water levels, *Idaho, Groundwater, Basic data collections, Aquifers, Petrology.

This report contains well records, 1974 wa measurements, and well location maps fo servation wells in Idaho maintained by the ical Survey during the 1974 calendar ye each well, the well description includes, i ble, the following information: latitude-lo number, local well number, owner, method struction, use of well, type of well (arte water table), formal aquifer name or lithol geologic age, diameter of casing, depth depth of perforations or screen, altitude surface datum, remarks of unusual condi fecting the water level, acknowledgment side persons or agencies contributing dat description of the measuring point. (W USGS)
W76-02139

REDWOOD NATIONAL PARK STUDIES RELEASE NUMBER 1: REDWOOD C HUMBOLDT COUNTY, CALIFORNIA TEMBER 1, 1973-APRIL 10, 1974,
Geological Survey, Menlo Park, Calif.
R. T. Iwatsubo, K. M. Nolan, D. R. Harden G. D. Glysson.
Open-file report, October 1975. 123 p, 4 fig 48 ref.

Descriptors: *Hydrologic data, *Surface *Water quality, *National parks, *Ca Ecosystems, Streamflow, Sediment tr Sedimentation, Water temperature, Envir tal effects, Land use, Chemical analysis, flow, Channel morphology.
Identifiers: Redwood National Park(Calif boldt County(Calif).

An interdisciplinary study has been under Redwood National Park, Calif., to descri of the ecosystems and recent changes in th sity of erosion and sedimentation, processes that may alter the natural eco and assess the impact of recent road cons and timber harvest. This report is the first ries that will present data collected in thi Stream-discharge and water-quality data w lected at 27 stations in the Redwood drainage basin. Measurements included lowing variables: Stream stage and dischar bidity; sediment; onsite water-quality det tions of temperature, pH, total alkalinity, conductance, and dissolved-oxygen con tion; chemical analysis of water samples fo dissolved solids, selected trace elements, and phosphorus, and organic carbon; c bacteria; benthic invertebrates; and seston tional data include changes in geometry stream-channel cross sections along Re Creek, distribution of erosional landform drainage areas of six tributaries to Re Creek, and quantity and chemical compos rain. (Woodard-USGS)
W76-02144

HYDROLOGIC DATA FOR COW B BRAZOS RIVER BASIN, TEXAS, 1973,
Geological Survey, Austin, Tex.
J. K. VanZandt.
Open-file report, May 1975. 74 p, 3 fig, 3 tab

Descriptors: *Hydrologic data, watersheds, *Texas, *Streamflow, *Rain noff relationships, Storms, Flood plains, protection, Runoff, Flood control, Water s Hydrologic budget.
Identifiers: *Cow Bayou(Tex), Mooreville(

This report, which is the thriteenth in a se basic-data reports published annually for th Bayou study area, contains the rainfall, and storage data collected during the 197 year for the 85.0 sq mi area above the strea ing station Cow Bayou at Mooreville, Texa 26 flood-retarding structures in the stud have a combined capacity of 15,510 acre-ft flood-spillway crests and regulate floodflow

area of 42.7 sq mi, or approximately 50 percent
he drainage area. The physical data at each of
26 floodwater-retarding structures above the
am-gaging station are summarized. The
ghted-mean rainfall during the 1973 water year
41.28 in., or 124 percent of the 15-year (1959-
average of 33.24 in. Monthly rainfall ranged
n 0.10 in. in August to 6.04 in. in September.
rly mean discharge at the stream-gaging sta-
was 48.9 cfs. compared with the 15-year
rage of 36.1 cfs. Annual runoff at the stream-
ing station was 35.410 acre-ft, or 7.81 in. Com-
ations for three storm periods include detailed
e breakdown of rainfall and discharge. Hydro-
phs and mass curves are drawn for illustrations.
storms selected occurred March 24, 1973,
y 25, 1973, and June 3, 1973. (Woodard-USGS)
6-02145

**TER-QUALITY ASSESSMENT OF THE IN-
NA DUNES NATIONAL LAKESHORE, 1973-**

logical Survey, Indianapolis, Ind.
primary bibliographic entry see Field 2K.
6-02147

**BLIC AND INDUSTRIAL WATER SUPPLIES
SOUTHERN MISSISSIPPI--1974,**

logical Survey, Jackson, Miss.
primary bibliographic entry see Field 4A.
6-02148

**OUND-WATER RESOURCES OF THE CAPE
TTERAS NATIONAL SEASHORE, NORTH
ROLINA,**

logical Survey, Raleigh, N.C.
D. Winner, Jr.
sale by USGS, Reston, Va 22092, price $1.00
set. Hydrologic Investigations Atlas HA-540,
5. 2 sheets, 5 ref.

scriptors: *Groundwater resources, *National
shores, *North Carolina, *Water supply,
drologic data, *Maps, Hydrographs, Aquifer
racteristics, Groundwater movement,
drogeology, Water wells, Saline water-fresh-
er interfaces, National parks.
ntifiers: *Cape Hatteras National
shore(NC).

fresh groundwater reservoir described in this
eet atlas of the Cape Hatteras National
shore, N. C., consists of a water-table aquifer
ch extends from the land surface to the first
fining beds of silt and clay, and confined or
i-confined aquifers beneath and between the
and clay beds. The water-table aquifer ranges
hickness from 10 to 50 feet and averages about
feet. The altitude of the water table averages 3
above mean sea level along the narrow parts
he seashore, and is as high as 10 feet at Cape
teras. Rainfall is responsible for the occur-
ce and maintenance of the fresh groundwater
rvoir, and most rain water enters directly into
water-table aquifer with little or no surface ru-
f. The presence of salty water at relatively shal-
depths is a factor affecting the withdrawal of
h groundwater, because any lowering of the
d in the aquifer, either naturally or by pump-
produces a rise in the interface. Therefore,
wdown is the key to the recovery of fresh
er in the seashore, and fresh-water recovery
be most efficient when drawdown is minimal.
method for accomplishing this is to spread
drawals over a larger area with a horizontal
instead of concentrating the effect at a point
a vertical well. (Woodard-USGS)
6-02149

**ODS IN THE FAJARDO-LUQUILLO AREA,
RTHEASTERN PUERTO RICO,**

logical Survey of Puerto Rico, San Juan.
J. Haire.

For sale by USGS, Reston, Va 22092, price $1.00 per set. Hydrologic Investigations Atlas HA-545, 1975. 1 sheet, 6 fig, 3 tab, 3 ref.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Flood data, *Puerto Rico, Hydrologic data, Flood frequency, *Maps, Hydrographs, Planning, Land use.
Identifiers: *Fajardo-Luquillo area(PR).

Factual and interpretive information are provided for major floods in the Fajardo-Luquillo area, Puerto Rico. The information is a technical basis on which the planner, engineer, administrator, or other interested persons can make decisions related to land use and development compatible with the degree of flood risk. Data include tabulations of flood discharge and flood stage, flood profiles, and a map of the areas inundated by the floods of 1960 in the Rio Fajardo basin; the floods in 1970 in the Rio Sabana, Rio Pitahaya and Rio Juan Martin basins; and the flood of 1972 in the Rio Mameyes basin. The areas of inundation are specifically for conditions that existed at the time of flood-frequency data is presented for selected sites. (Woodard-USGS)
W76-02150

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE MACHIAS-LUBEC AREA, WASHINGTON COUNTY, MAINE,
Geological Survey, Augusta, Maine.
G. C. Prescott, Jr.
For sale by USGS, Reston, Va 22092, price $1.00. Hydrologic Investigations Atlas HA-535, 1974. 1 sheet, 13 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Water wells, *Maine, Water yield, Water level fluctuations, Hydrogeology, Surface-groundwater relationships, *Maps.
Identifiers: *Washington County(Maine), *Machias-Lubec area(Maine).

This report of the Machias-Lubec area is one of a series describing the geologic and hydrologic conditions governing the occurrence of groundwater in Maine. The information is intended for those doing resource planning, or for those wishing to develop water supplies, particularly supplies large enough for public, industrial, or commercial use, from groundwater sources. The Machias-Lubec area includes about 330 sq mi in Washington County on the eastern border of Maine. Included are parts or all of the following towns or townships: Cutler, Dennysville, East Machias, Eastport, Edmunds, Lubec, Machias, Machiasport, Marion, Marshfield, Pembroke, Perry, Roque Bluffs, T. 18 E.D., Trescott, Whiting, and Whitneyville. The depth of 218 bedrock wells ranged from 20 to 855 feet. The average depth was 168 feet, and the median depth was 140 feet. Thirteen percent of the bedrock wells had a yield exceeding 15 gpm. Most of these were in the 51-to 100-foot depth range. The quality of the groundwater is generally good for most purposes. It is normally low in dissolved solids and soft. (Woodard-USGS)
W76-02151

LANDSAT, A SATELLITE SURFACE WATER DIVINING ROD,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
K. J. Hancock, and E. H. Schlosser.
In: Papers from the Fall Convention, American Society of Photogrammetry, October 26-31, 1975, Falls Church, Virginia, p 375-380, (1975).

Descriptors: *Remote sensing, *Surface waters, *Hydrologic data, *Computer programs, *Mapping, Computers, Lakes, Data processing, Instrumentation, Data collections, Water, Hydrology, Surveys, Maps, Bodies of water.
Identifiers: LANDSAT, DAM(Detection and Mapping) package.

The DAM (Detection and Mapping) package was developed to provide accurate, up-to-date, economical and properly formatted maps of surface water using LANDSAT earth resources satellite digital data. The DAM package is an integrated system of computer programs, step-by-step manual procedures, and special graphic devices. The total procedure consists of acquiring the data, establishing the control network, specifying the map characteristics, and generating the maps. Using published LANDSAT catalogs, the user selects relatively cloud-free scenes over the areas of interest, and then orders computer tapes and positive transparencies, and appropriate maps. In the control network establishment step, the user selects 6 to 18 well-defined control points on a LANDSAT scene for which a computer program corrects the MSS coordinates. Map characteristics can then be specified and the computer programs perform the following operations: (1) adjust network and determine registration coefficients; (2) classify all pixels as water or non-water; (3) join classified data derived from separate tapes; (4) check all specifications and flag errors; and (5) register, format, annotate and output all maps. (Robinett-Arizona)
W76-02162

FLOOD PLAIN MAPPING: PHOTOGRAMMETRIC DATA FOR HYDROLOGY,
Hurd (Mark) Aerial Surveys, Inc., Minneapolis, Minn.
J. T. Dozzi.
In: Papers from the Fall Convention, American Society of Photogrammetry, October 26-31, 1975, Falls Church, Virginia, p 633-639, (1975), 1 tab.

Descriptors: *Flood plains, *Photogrammetry, *Mapping, *Aerial photography, *Flood profiles, Cross-sections, Maps, Photography, Surveys, Topography, Flood control, Flood protection, Hydrology, Flood plain zoning, Rivers, Streams, Floods, Cameras, Remote sensing, Terrain analysis, Elevation, Computer programs, Indirect flood measurement.
Identifiers: *Flood plain mapping, Base maps, Mosaics, Orthophotos, Stereo photography.

Because of the cost and time required for flood plain mapping using conventional techniques, it was envisioned that the stereo plotter could be utilized to develop data in a simple useable format for the hydrologist. Work was conducted with State-Federal agencies and consulting hydrologists to develop and utilize mapping techniques providing elevation and base data necessary for the detailed flood plain studies. The method has been to photogrametrically digitize overbank valley cross sections on a data card format ready for the hydrologist's step-backwater computer program. Base maps are prepared simultaneously in the form of line drawings, mosaics, or orthophotos. After the hydrologist has determined the elevations for flood water profiles, the stereo models can be reset and the flooded area delineated by a sloping elevation line which represents where high-water intersects with high ground. Since 1968 over 30 such flood plain mapping projects have been completed. (Robinett-Arizona)
W76-02164

REMOTE SENSING AS AN AID TO COMMUNITY DEVELOPMENT IN AN ARID AREA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7B.
W76-02165

LINEAR PROGRAMMING ANALYSIS OF BRANCHED PIPE NETWORK,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-02366

LIBRARY U. OF I. URBANA-CHAMPAIGN

WATER QUALITY MONITORING AND RIVER BASIN PLANNING: A CRITIQUE AND SOME RECOMMENDATIONS,
Rutgers-The State Univ., New Brunswick, N.J. Div. of Urban Studies.
For primary bibliographic entry see Field 5A.
W76-02378

RESULTS FROM THE CERC WAVE MEASUREMENT PROGRAM,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W76-02400

GENERATION OF HOURLY RAINFALL,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-02416

ESTIMATING ENERGY BUDGET COMPONENTS TO DETERMINE LAKE HURON EVAPORATION,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich., Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2D.
W76-02425

A NUMERICAL MODEL OF MATERIAL TRANSPORT IN SALT-WEDGE ESTUARIES, PART 1. DESCRIPTION OF THE MODEL,
Geological Survey, Menlo, Park, Calif.
For primary bibliographic entry see Field 2L.
W76-02481

A NUMERICAL MODEL OF MATERIAL TRANSPORT IN SALT-WEDGE ESTUARIES, PART II. MODEL COMPUTATION OF SALINITY AND SALT-WEDGE DISSOLVED OXYGEN IN THE DUWAMISH RIVER ESTUARY, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2L.
W76-02482

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS--VOLUME 1. BASINS FROM JAMES RIVER TO SAVANNAH RIVER.
Geological Survey, Reston, Va.
Available from Supt of Documents, GPO, Wash, DC, 20402, price $6.60 (paper copy). Water-Supply Paper 2104, 1974. 1018 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Lakes, Southeast U.S., Georgia, North Carolina, South Carolina, Virginia, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Reservoirs, Water levels, Hydrologic data.
Identifiers: Maximum discharges, Minimum discharges.

This is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the South Atlantic slope and eastern Gulf of Mexico basins, James River to Savannah River. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaris of total, average, maximum, and minimum discharges. (Woodard-USGS)
W76-02486

LIMNOLOGICAL DATA FOR DONNER LAKE, CALIFORNIA, MAY 1973 THROUGH DECEMBER 1973,
Geological Survey, Sacramento, Calif
For primary bibliographic entry see Field 2H
W76-02487

SOLID-WASTE DISPOSAL SITES IN RELATION TO WATER RESOURCES IN THE SEATTLE-TACOMA URBAN COMPLEX AND VICINITY, WASHINGTON,
Geological Survey, Tacoma, Wash
R. T. Wilson.
Open-file report 75-344 (Basic-Data Contribution 6), 1975. 1 sheet, 1 map, 1 fig, 1 tab, 17 ref.

Descriptors: *Water pollution sources, *Groundwater, *Solid wastes, *Waste dumps, *Washington, Hydrologic data, Path of pollutants, Groundwater movement, Leachate, Environmental effects, Urbanization, Streams, Hydrogeology, Water quality, *Maps.
Identifiers: *Seattle-Tacoma area(Wash)

Solid-waste deposits are adversely affecting the environment in the Puget Sound basin, Washington, especially water resources at and near disposal sites. An adequate evaluation of the environmental impact of solid-waste disposal in the basin requires reliable data on waste deposits and their environmental setting. As an acid to such evaluation, this report (1) presents an inventory of currently active, many former (inactive), and a few planned solid-waste disposal sites; (2) provides information about the active sites in relation to some features of the local environment; and (3) discusses relationships between solid-waste disposal and water quality in a rapidly urbanizing part of the Puget Sound region. Also presented is a graphic portrayal of some undesirable results of solid-waste disposal in areas of moderately permeable rock materials. (Woodard-USGS)
W76-02489

HYDROLOGIC UNIT MAP--1974, STATE OF IDAHO.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.25.
Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Idaho, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Idaho), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Idaho that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-02490

HYDROLOGIC UNIT MAP--1974, STATE OF NEVADA.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va 22092, price $1.25.
Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Nevada, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps, *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Nevada that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-02491

LIMNOLOGICAL DATA REPORT FOR MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION--U.S. GEOLOGICAL SURVEY COOPERATIVE LAKE STUDIES PROJECT,
Geological Survey, Augusta, Maine.
D. J. Cowing, and M. Scott.
Open-file report, October 1975. 135 p, 1 fig, 10 ref.

Descriptors: *Limnology, *Lakes, *Water quality, *Epilimnion, *Maine, Lake morphometry, Data collections, Physical properties, Chemical properties, Biological properties, Chemical analysis, Sampling, Pollutant identification.

The report contains physical, chemical, and biological information collected on 43 Maine lakes during the 1974 calendar year. Methods for the collection and analysis of the hydrologic data are outlined. Physical characteristics listed include drainage area, surface area, surface elevation, volume, maximum depth, mean depth, epilimnion depth, epilimnion volume, and length of shoreline. Water-quality analyses are listed for up to 30 parameters on the lake sample sites and 3 parameters on flowing tributaries. Biological analyses include phytoplankton data for 35 of the study lakes and bacterial data on selected tributaries. (Woodard-USGS)
W76-02492

WATER TEMPERATURE-INFLUENTIAL FACTORS, FIELD MEASUREMENT, AND DATA PRESENTATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-02494

GROUND-WATER RESOURCES OF GEORGETOWN COUNTY, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 4B.
W76-02496

A DIGITAL-COMPUTER MODEL FOR ESTIMATING DRAWDOWNS IN THE SANDSTONE AQUIFER IN DANE COUNTY, WISCONSIN,
Wisconsin Geological Survey, Madison.
For primary bibliographic entry see Field 4B.
W76-02498

COMPUTERIZED REDUCTION OF METEOROLOGIC MEASUREMENTS FOR IRRIGATED AND NONIRRIGATED PLOTS IN CENTRAL UTAH,
Brigham Young Univ., Provo, Utah. Dept. of Zoology.
F. L. Andersen, and P. R. Roper.
Great Basin Naturalist, Vol 35, No 2, p 203-218, June 30, 1975. 18 fig, 5 tab, 8 ref, 1 append.

scriptors: *Irrigation effects, *Computer programs, *Data processing, *Meteorological data, microenvironment, Irrigated land, Soil-water-nt relationships, Environmental effects, teorology, Weather data, Precipita-n(Atmospheric), Soil moisture, Humidity, Dew, aporation, Cloud cover, Wind velocity, Tem-ature, Evapotranspiration, *Utah, Irrigation.
ntifiers: Provo(Utah), FORTRAN IV computer gram.

o FORTRAN IV computer programs were eloped to facilitate the reduction of eorologic data from irrigated and nonirrigated s at Provo, Utah. The first program compiles tabulates daily, monthly, and yearly summa- of precipitation as rain and/or snow, snowfall, l snow cover, soil moisture, dew, relative hu-ity, potential evaporation, cloud cover, and d. Temperature is tabulated for a standard ther shelter, on bare ground, at the soil surface er grass cover, and 5 cm beneath the soil sur-e under grass cover. The second program ena-s complete computerized (Calcomp) construc-, labeling, and graphing of 10 different eorologic measurements and 3 calculated com-isons of temperature means. Mean tempera-es for 5 cm beneath the soil surface and at the surface under grass cover, and on a bare soil face were consistently lower on the irrigated compared to the nonirrigated area. Soil isture was higher (22.7 percent moisture) on the gated area compared to the nonirrigated (9.4 cent moisture). The other meteorologic data, in ition to temperature and soil moisture, phasize the marked beneficial impact of irriga-in creating favorable microenvironments for ng organisms. (Robinett-Arizona)
6-02500

ENGINEERING WORKS

. Hydraulics

OODFLOW CHARACTERISTICS AT OPOSED BRIDGE SITE ON MOHAWK VER, WHITESBORO, NEW YORK,
ological Survey, Albany, N.Y.
primary bibliographic entry see Field 4A.
6-02136

OODFLOW CHARACTERISTICS AT OPOSED BRIDGE SITE ON WEST BRANCH LAWARE RIVER, DELHI, NEW YORK,
ological Survey, Albany, N.Y.
primary bibliographic entry see Field 4A.
6-02137

PACITIES OF STACKS IN SANITARY AINAGE SYSTEMS FOR BUILDINGS,
tional Bureau of Standards, Washington, D.C.
S. Wyly, and H. N. Eaton.
ailable from the National Technical Informa-n Service, Springfield, Va 22161 as COM-75-45, $4.50 in paper copy, $2.25 in microfiche.
tional Bureau of Standards MN 31, July 3, 1961. p, 41 fig, 16 tab, 20 ref, 3 append. (Reprinted h corrections June 1965).

scriptors: *Plumbing, *Hydraulics, Hydraulic ineering, Drains, Drainage, Drainage systems, w, Pipes.
ntifiers: Drainage stacks, Pipe sizes.

adequate knowledge of the hydraulics and umatics of building drainage systems is neces-y for the computation of the minimum sizes of es that can be used satisfactorily in the various ts. Experimental studies of the hydraulics and umatics of plumbing systems conducted at the tional Bureau of Standards and other laborato- since 1921 on the capacities of stacks and izontal branches are discussed. The application of research results to the computation of loads for drainage and vent stacks is illustrated. Some of the loadings found in current tables of plumbing codes are compared with loadings computed in this paper. Conclusions are presented in the following areas: intererence of flows at junctions of drainage stack and horizontal branches; flow capacities of drainage stacks; air flow in drainage systems; loading tables; distribution of air and water in cross sections of drainage stacks; velocity distribution of water in cross sections of drainage stacks; and, pneumatic pressures within drainage stacks. Additional research is needed on design flow and flow capacity problems. (Orr-FIRL)
W76-02201

INVESTIGATION OF THE HYDRAULICS OF HORIZONTAL DRAINS IN PLUMBING SYSTEMS,
National Bureau of Standards, Washington, D.C.
R. S. Wyly.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-75-10046, $4.00 in paper copy, $2.25 in microfiche. National Bureau of Standards MN 86, December 18, 1964. 38 p, 26 fig, 23 tab, 18 ref, 4 append.

Descriptors: *Sewers, *Plumbing, *Hydraulics, Hydraulic engineering, Hydraulic design, Pipes, Drains, Hydraulic gradient, Flow.

An investigation of the hydraulics of flow in experimental equipment which simulated nominally horizontal simple and branching drains of plumbing systems is discussed. It is necessary to know the hydraulics of these drains when building sanitary drainage systems in order to rationally determine the minimum pipe sizes for these systems. Information concerning the hydraulics of sanitary building drains and building sewers as well as some of the factors which affect their hydraulic capacities are reported. Conclusions are presented for the following areas: estimating hydraulic capacity; design of plumbing systems with minimum venting; utilization of field data and of data on surge attenuation; effect of surge-duration time, drain slope, and other factors on hydraulic capacity; surge-flow capacities of simple drains; steady flow capacities of compound drains; capacities for surge flow superimposed on steady flow; and, computation of allowable fixture-unit loads. There is a need for further research in this area, especially in relation to hydraulic performance of drain systems as affected by steep slopes, drain storage volume, energy losses at stack bases, attenuation of water depths and discharge rates in long drains, and large drain diameters. The results of this investigation have important applications for the writing of plumbing codes and handbooks with respect to the optimum plumbing loads on building drains and building sewers. (Orr-FIRL)
W76-02218

IRRIGATION CANAL, WATER-WITHDRAWAL WEIR,
For primary bibliographic entry see Field 3F.
W76-02248

EFFICIENT AND NONPOLLUTING METHOD FOR RECOVERING GEOTHERMAL HEAT ENERGY,
For primary bibliographic entry see Field 4B.
W76-02255

LINEAR PROGRAMMING ANALYSIS OF BRANCHED PIPE NETWORK,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-02366

SURFACE ROUGHNESS EFFECTS ON THE MEAN FLOW PAST CIRCULAR CYLINDERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
O. Guven, V. C. Patel, and C. Farell.
IIHR Report No 175, May 1975, 184 p, 78 fig, 30 tab, 40 ref, 2 append. NSF GK-35795.

Descriptors: *Roughness(Hydraulic), *Fluid mechanics, *Drag, *Pressure drag, *Laboratory tests, *Flow around objects, Boundary layers, Reynolds number, Cooling towers, Analysis, Design data, Flow separation, Turbulence, Velocity.
Identifiers: *Drag coefficients, Aerodynamics, Pressure distribution, Pressure coefficients, Wind tunnels.

The effects of surface roughness on the mean pressure distribution and the boundary-layer development on a circular cylinder in a uniform stream were investigated experimentally. Sandpaper roughness and rectangular meridional ribs were tested over a Reynolds-number range from 70,000 to 550,000. The effects of rib roughness were similar to those to distributed roughness. In the case of large ribs, strong local effects were observed. Results were examined in the light of boundary-layer theory and previous data, and were supported by this analysis. Special attention was given to variations in the drag coefficient and pressure-distribution parameters with surface roughness at large Reynolds numbers. When the Reynolds number exceeded a certain value, determined by the roughness, the pressure distribution became dependent only on the roughness geometry. Substantial reductions in the magnitude of the minimum pressure coefficient on large cylindrical structures, such as hyperbolic cooling towers, were shown to be obtainable by roughening the external surface with meridional ribs. The results also indicated that pressure distributions on prototypes could be reproduced on scaled models by employing a proper combination of Reynolds number and surface roughness. Experiments were also performed with a rough-walled cylinder and movable side-walls to study the influence of wind-tunnel blockage on the pressure distribution. The results, described in an appendix, verified a blockage-correction procedure proposed previously. (Adams-ISWS)
W76-02402

AN EMPIRICAL DESCRIPTION OF WALL JET VELOCITY PROFILES,
Indian Inst. of Tech., Madras (India), Dept. of Applied Mechanics.
N. V. C. Swamy, B. H. L. Gowda, and N. Chandrashekhar.
Indian Journal of Technology, Vol 13, No 3, p 103-106, March 1975, 6 fig, 1 tab, 10 ref.

Descriptors: *Jets, *Velocity, *Friction, *Turbulent flow, Dimensions, Boundary layers, Shear stress, Viscosity, Equations.
Identifiers: *Wall jets, *Empirical relation, Two-dimensional, Radial, Three-dimensional, Skin friction.

An empirical expression was proposed to describe the velocity profiles of two-dimensional, radial, and three-dimensional wall jets. Comparison with available experimental data showed that the empirical expression represented the velocity profile quite well for the three types. The values of skin friction obtained using the proposed function at points very close to the wall were also discussed. (Bhowmik-ISWS)
W76-02407

TOPOLOGICALLY RANDOM CHANNEL NETWORKS IN THE PRESENCE OF ENVIRONMENTAL CONTROLS,
New South Wales Univ., Kensington (Australia). School of Geography.
A. D. Abrahams.

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Geological Society of America Bulletin, Vol 86, No 10, p 1459-1462, October 1975, 1 fig, 5 tab, 23 ref.

Descriptors: *Channel morphology, *Channel flow, *Stochastic processes, *Geomorphology, *Environmental control, Statistical methods, Microclimatology, Geologic control, Pleistocene epoch, Streams, Networks, Australia.
Identifiers: *Channel networks, Topology, Stream numbers, *New South Wales(Australia).

In areas where environmental controls have a preferred orientation, certain topologically distinct channel networks may be promoted where networks of a given magnitude flow in one direction and inhibited where they flow in another; but these biases in network topology may compensate for one another so effectively that they do not give rise to identifiable systematic deviations from topological randomness. This theme was illustrated by analyses of magnitude-4 channel networks from three areas in southeastern Australia. Goodness-of-fit tests indicated that the exhaustive samples of networks from these areas could have been drawn from topologically random populations. However, similar tests applied to subsamples selected according to network flow direction revealed biases in network topology in two of the areas. These biases, which were apparently due to microclimatic controls, signified that, although the networks in each area may belong to a topologically random population, they are not composed of randomly merging stream channels. (Singh-ISWS)
W76-02408

SEDIMENT TRANSPORT IN SMOOTH FIXED BED CHANNELS,
Newcastle upon Tyne Univ., (England). Dept. of Civil Engineering.
P. Novak, and C. Nalluri.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY9, Proceedings Paper 11556, p 1139-1154, September 1975. 10 fig, 17 ref, 2 append.

Descriptors: *Sediment transport, *Sediment load, *Hydraulics, *Tractive forces, *Open channel flow, Flumes, Conduits, Slopes, Laboratory tests, Sewers, Bed load, Analytical techniques, Sediments, Shear stress, Flow.
Identifiers: *Incipient motion, Critical velocity.

Incipient motion of discrete particles resting on a fixed smooth channel bed and sediment transport as bed load were investigated in circular conduits and rectangular flumes with free surface flow. The investigations were carried out in a tilting flume and the flow patterns and sediment movement were observed in a glass section. Equations for the critical velocity and critical shear stress were derived. These equations enabled a comparison with criteria generally adopted for movable beds. A higher value of critical velocity or shear stress was indicated for a rectangular channel than for a channel with circular cross section. A dimensionless plot of critical velocity and flow depth was obtained, suggesting that a full correlation for incipient motion of sediment particles in any conveyance shape with a fixed smooth bed is valid. The engineering implications of these results were examined, with the conclusion that the critical velocities obtained were appreciably lower than those normally adopted, for example, in sewer design. (Singh-ISWS)
W76-02409

TURBULENT DENSE PLUMES IN A LAMINAR CROSS FLOW,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
V. H. Chu.
Journal of Hydraulic Research, Vol 13, No 3, p 263-279, 1975. 6 fig, 1 tab, 14 ref.

Descriptors: *Jets, *Laminar flow, *Entrainment, *Circulation, *Model studies, Laboratory tests, Buoyancy, Vortices, Turbulence, Flow, Mixing, Drag, Velocity, Density
Identifiers: *Turbulent dense plumes, Mechanistic models.

Turbulent 'dense plumes' in a laminar cross flow were simulated in the laboratory by injecting saline solution vertically upward into an open channel flow. In the experiment, the large scale vortex-like circulation, responsible for turbulent entrainment of the cross flow into the plume, was observed to reverse after the plume reaches the peak and descends. The experiment was performed to verify an entrainment theory in the study of buoyant forced-plumes in cross flow. The theory, which involves only one unknown parameter--the entrainment coefficient, was based on a mechanistic model which describes the formation of the circulation of the vortex pair in the plume. In comparing the theory with the experiment, the entrainment coefficient for dense plume was found to be a constant, approximately equal to 0.5. The same constant was obtained for momentum jets and buoyant plumes. (Singh-ISWS)
W76-02418

A CONTRIBUTION TO THE STUDY OF VORTEX RIPPLES,
Cambridge Univ. (England). Dept. of Engineering.
J. F. A. Sleath.
Journal of Hydraulics Research, Vol 13, No 3, p 315-328, 1975, 4 fig, 13 ref.

Descriptors: *Waves(Water), *Vortices, *Numerical analysis, *Sediment transport, *Mixing, Wavelengths, Turbulence, Model studies, Analytical techniques, Hydraulics, Flow, Ripple marks, Laminar flow.
Identifiers: *Vortex ripples, Fluid drift.

The fluid velocities close to a two-dimensionally rough bed in oscillatory flow were solved by numerical solution of the equation of vorticity. It was observed that the fluid close to the bed drifts towards the crests, and it was suggested that this provides a mechanism for the formation of vortex ripples by water waves. On the assumption that the ripples which form correspond to maximum fluid drift towards the crest, a theoretical relationship was derived for ripple wavelength in terms of the flow parameters. This relationship showed quite good agreement with experimental results for ripples when sediment exchange between adjacent crests was small. The most notable omission from the theoretical model was the neglect of turbulence. The fact that the difference between the theoretical curve and the experimental results was small added weight to the suggestion that the flow continues to be dominated by the large-scale mixing by vortex formation and decay. (Singh-ISWS)
W76-02419

8C. Hydraulic Machinery

PUMPS AND VALVES FOR THE WATER INDUSTRY.
Water Services, Vol 79, No 954, p 333-334, August 1975, 1 fig.

Descriptors: *Pumps, *Sewerage, *Valves, Water treatment, Waste water treatment, Flow rates, Sewage treatment, Treatment facilities, Sealants.
Identifiers: Dry weather flow.

Several pumps and valves for sewerage and water treatment have been developed in Great Britain. A new Tuke and Bell, Rolls Rotary positive displacement crude sewage pump was designed to solve large flow problems at pump fed, small sewage treatment plants. Each pump is rated at the preferred 1.5 times dry weather flow; a duty assist pump can provide a back-up three times dry weather flow when required. In another case problem of controlling sewage flow to a tempo treatment system has been solved with close pled Freway vertical spindle pumps. These stract a proportion of crude sewage at the works in order to provide a constant BOD lo the temporary plant. Relief valves to ensure s against external hydraulic pressures particu from high water tables in treatment tanks pools, were also described. An 80 mm up pressure relief valve has also been patented, w has flexible sealing faces to maintain an effe seal in the presence of sand and silt. (Kra FIRL)
W76-02173

BIG BACKHOE BOOSTS SEWER FOOTAG
Roads and Streets, Vol 118, No 10, p 102-104 tober, 1975.

Descriptors: *Sewerage, *Sewers, *P *Construction equipment, Pipelines, Pumps, watering, Installation, Concrete pipes, New sey.
Identifiers: Hydraulic backhoe, Trenching.

High-speed trenching and setting of sewer p near Lakewood, New Jersey, has been achi with a 5 cu yd hydraulic backhoe. The concrete pipe is being installed at 250 to 400 f nine-hour day in open country. A total of 30,0 of interceptor sewer pipe are being insta mostly into open trench work. After the trenc cut and excess spoil is side-cast, dewatering is complished, using submersible pumps to b down the water table. Special problems in this ject involved: the 200-ft crossing of a shallow l completed by setting pipe between two line sheeting that formed a cofferdam; the jackin heavy-walled 66-in concrete pipe at seven 70-f tervals under highway and rail traffic crossi and the steps required to protect the environm from noise and dust in urban areas. (Kra FIRL)
W76-02203

BACKHOE AND LOADER TEAM UP UNUSUAL SEWAGE SYSTEM.
Roads and Streets, Vol 118, No 10, p 110, tober, 1975.

Descriptors: *Septic tanks, *Waste water tr ment, *Construction, *Sewerage, Engineer Drainage, Pipes, Installation.
Identifiers: *Backhoes.

Sommer Construction Company of Nampa, Ida is building three large septic tanks to service an home development, each tank servicing 27 hom These septic tanks are each 8 ft high, 12 ft w and 30 ft long, and are being constructed with a cu yd P and H backhoe and a 2 1/2 yd loader. the backhoe excavates, the loader moves spoi ft back from the excavation. The loader t places a gravel base and drain pipes before cast-in-place tank is installed. Excavations for tanks measure 12 ft deep, 20 ft wide, and 3 long. The backhoe initially excavates a 12 ft de 10 ft wide, and 36 ft long section, then moves complete the other half. Drain beds measure 1 deep, 30 ft wide, and 78 feet long, and excavat for both the tanks and drain beds requires ab one week. After completing the excavation, a cu yd dump truck hauls the gravel for bedding loader spreads the bedding and drain pipes then be laid on a flat grade, and covered w another gravel layer. At the end of the constr tion process, the excavated material is returned the hole by the loader. (Kramer-FIRL)
W76-02204

EVALUATION OF ICE MANAGEME PROBLEMS ASSOCIATED WITH OPERATI

A MECHANICAL ICE CUTTER ON THE ISSISSIPPI RIVER,
ild Regions Research and Engineering Lab., anover, N.H.
D. Ashton.
ailable from the National Technical Informan Service, Springfield, Va 22161 as AD-A002 8, $4.00 in paper copy, $2.25 in microfiche. Spel Report 214, October 1974. 37 p, 22 fig, 7 tab, ref. Coast Guard MIPR Z-70099-3-32744.

escriptors: *Mississippi River, *Ice, avigation, Rivers, Ice loads, Ice breakup, Ice ns, Ice cover, Inland waterways, Navigable ters, Navigable rivers, Cold regions, Freezing.
entifiers: *Mechanical ice cutters, Icebreakers.

e management problems associated with operan of a mechanical ice cutter for use in icebreakg as an aid to winter navigation were examined. e study concentrated on effects occurring after e cutting operation. Included in the evaluation re assessments of refreezing rates, movement d disposition of the slabs produced by the tting, and examination of effects related to ice ms. The evaluation was specific to the upper ississippi River, in particular Pool 19 above ck and Dam 19 at Keokuk, Iowa. It was found at most ice production during a winter occurs ring a small fraction of the period of ice cover; nce, removal after these short periods may low navigation to proceed for significant winterne periods. A relation was found between cut ab dimensions and critical velocity to move them at will enable estimates to be made of accumulan. Breakage of adjacent ice by vessel waves was und to impose a possible restraint on vessel eed but not a serious one. (Sims-ISWS)
76-02396

F. Concrete

FAIL-SAFE SUBAQUEOUS CONCRETE EWER,
meron Pipe Products Group, El Monte, Calif. outhern California Div.
G. Emerson.
ivil Engineering-ASCE, Vol 45, No 9, p 77-78, ptember, 1975, 1 fig.

escriptors: *Sewers, *Joints(Connections), ipelines, *Construction materials, *Concrete, stallation, Waste water treatment, California.
entifiers: Sewerage collection, San Diego(Calif).

o improve collection system for the city of San iego, it was necessary to add a second force ain. Because the new pipeline would travel two iles subaqueously along the floor of the San iego Bay, very stringent specifications for a leakoof sewer force main were required. A concrete d steel joint was developed of a design using ree 0-ring gaskets and both bell and spigot eleents at each end of each pipe section. The pipe itlf is made of a rod-wrapped steel cylinder and ge and is encased in a 13-inch wall of vertically st concrete. The configuration of a double mated int system with a single O-ring gasket around a eel spigot and two O-ring gaskets around a doued grooved concrete spigot provides a watergh seal, protecting the steel joint rings from the fects of salt water. A unique minus-pressure chnique is used to join the two pipe sections der water during installation. To place the peline in its location at San Diego Bay, material as dredged from the bay flood and released as itive backfill over the pipe; the trench created as graded for pipe installation, and the pipe was bmerged. When all three O-rings were in proper ntact, as determined with a gage, a vacuum line as applied between the bells to pull the joint into total, water-tight seal. An average of four 57-ton pe sections were installed per day. Internal testg of each pipe joint plus cleaning of the annular ace between O-ring gaskets were also perrmed. (Kramer-FIRL)
76-02171

8G. Materials

ERTS-1 DATA IN SUPPORT OF THE NATIONAL PROGRAM OF INSPECTION OF DAMS,
National Aeronautics and Space Admistration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W76-02029

SEWER LINING--THE TORONTO TECHNIQUE,
Department of Public Works, Toronto (Ontario).
A. W. Pellegrino.
The American City and County, Vol 90, No 9, p 86-87, September 1975.

Descriptors: *Plastic pipes, *Repairing, *Sewers, *Equipment, Pipelines, Maintenance, Infiltration, Equipment, Cleaning, Canada.
Identifiers: *Reaming, *Television inspection, Toronto(Ont).

A technique has been developed for increasing flow capacity in deteriorating sewer lines by the insertion of high density polyethylene pipe. This rehabilitation technique was used by the city of Toronto and was found to increase sewer capacity, decrease costs, and avoid leaking and infiltration. Prior to relining, a study of site conditions was made to determine locations of all private drains connecting to the sewer. Closed circuit television was used both to inspect the system for cracks, protrusions, and obstructions, and to observe the action of the reaming operation. Reaming out obstructions was performed from one manhole to the next, a distance of 300 feet. Maintenance of the reaming equipment, including daily motor and bearing lubrication, was essential to the success of the procedure. After the reamer had been used, the entire length of the sewer was flushed out to remove debris. The actual insertion of the plastic liner involved positioning a continuous fused length of pipe on rollers with a vibrating nose cone attached to it. The linear was pulled into the old sewer by means of a winch truck positioned over a manhole about 500 feet away. Immediately after the plastic liner had been inserted, lateral cutting and grouting was carried out to connect all drains. Over a mile of these linings have been inserted in Toronto, with no failure and a properly functioning sewer system in all cases. (Kramer-FIRL)
W76-02172

NEW SEWER SURVEY TV CAMERAS.
Water, No 5, p 37, October 1975, 1 fig.

Descriptors: *Monitoring, *Sewers, Equipment, Control systems, Cameras, Remote sensing.
Identifiers: Television inspection.

A new sewer survey camera, manufactured by Seer TV Surveys Limited, Surrey, Great Britain, uses only a 12 volt supply to feed both the electronics and the remote control motors. These operate from a simple camera control unit established in the mobile survey unit. By eliminating the need to pass voltage signals through the camera cable, the camera is more suitable for gas and chemical lines where high powered lighting increases the risk of lamp explosion and ignition of flammable substances. A low light level camera system was also manufactured which can achieve remarkable results using only up to 10 watts of light. The lamp is mounted in a sealed flashproof and impact resistant capsule which is situated at the front of the camera casing. (Kramer-FIRL)
W76-02174

LASER TUNNELLING GUIDANCE SYSTEM.
Water, No 5, p 36, October 1975.

Descriptors: *Sewers, *Tunneling, *Lasers, *Construction, Monitoring, Equipment, Sensors, Tunnel construction, Remote sensing.
Identifiers: Light sensitivity.

A new laser guidance system was developed to improve accuracy in tunnelling. Marketed by Mini Tunnels International Surrey, Great Britain, the guidance system uses a light sensitive quadrant in a 150 mm diameter steel tube which replaces the normal target for the laser beam. The value of light upon each quadrant section serves a digital reader device fixed near the miner within the shield and gives a reading in millimeters of the shield deflection from datum. A repeater installed in the office is used to monitor the tunnel drive. A continuous gas sampling detector, also newly developed, performs routine gas detection in the tunnels and does not rely upon vulnerable portable equipment. This sensor runs from the tunnel lighting supply; two sensing tubes draw in samples from different points in the driving shield. In the event of dangerous gases reaching a predetermined threshold level, tunnel lights will flash a danger signal. (Kramer-FIRL)
W76-02177

PLASTIC MORTAR PIPE SOLVES JOINT PROBLEM,
C. A. Carlson.
Water and Sewage Works, Vol 122, No 9, p 84-85, September 1975.

Descriptors: *Sewers, *Pipelines, Plastic pipes, Construction materials, Recycling, Construction costs, Environmental effects, California.
Identifiers: Southern Laguana(Calif).

The Southern Laguana, California, Sanitary District has replaced a badly deteriorated 21-inch vitrified clay pipeline with a new 24-inch diameter reinforced plastic mortar pipe over a two mile area. As part of the sewer reconstruction project, the 21-inch clay pipe was crushed into aggregate-size particles inside the tunnel and was used as additional bedding for the replacement pipe. After a crusher had broken the old clay pipe and made new grade, new sections of ten-foot (24-inch diameter) Techite pipe were transported to the site; laser equipment was used for alignment. This disposal method, by reusing the old pipe, saved the district over $100,000 in construction costs. Because access to public and private beach areas was necessary for the project, public relations were very important. Except for temporary storage of pipe, construction equipment, and tools, the impact on the ecology of the beach area was minimal. (Kramer-FIRL)
W76-02178

HORSHAM TESTS COMPLETE.
Surveyor, Vol 146, No 4343, p 44, September 5, 1975.

Descriptors: *Laboratory tests, *Analytical techniques, Sewage treatment, Treatment facilities, Filtration, Screening, Pumps, Equipment, Model studies,
Identifiers: *Sumps.

Laboratory tests have been conducted on a model of the sump of the new Horsham sewage works. This test program was an integral part of Sigmund Pulsometer Projects' 420,000 contract to supply the pumps and ancillary equipment. New sewage works at Horsham are being built for the Southern Water Authority; the existing works, built in the 1930's, will be demolished. The new facilities, will serve a population of 47,500, and may be expanded to serve twice that number of people. On the basis of these tests, a double filtration system has been manufactured. This includes three 14/16 inch variable speed drive centrifugal pumps, three 14/16 inch main feed pumps, two 4-inch vortex grit pumps, as well as screening disintegrators, screw pumps, screens, grit air blowers, and a standby generator. (Kramer-FIRL)

W76-02194

SEWER PIPE RUN PASSES DEFLECTOMETER TESTS.
Water and Sewage Works, Vol 122, No 9, p 68-69, September 1975, 8 fig.

Descriptors: *Sewers, *Pipelines, *Plastic pipes, Construction materials, On-site tests, Analytical techniques, Engineering, Waste discharge, Virginia.
Identifiers: Deflectometer, Gravity sewers.

A 900-ft run of ten-inch PVC gravity sewer pipe installed near Fredericksburg, Virginia, was field tested to assure that it met the engineering requirement of ten percent maximum deflection. Tests were carried out with a new electronic deflectometer designed and produced by HMJ Manufacturing and Sales. For this sewer line, which is part of a county-wide $5.5 million sewer and treatment project, the maximum PVC pipe deflection was found to be six percent. Average vertical deflections ranged from 2 to 3%; horizontal deflections tended to be lower. This sewer pipe has burial depths ranging from 27 to 39 ft, and the tested section originated near a recently-expanded pumping station. The pipe runs 4000 feet to discharge into an existing ten-inch line. (Kramer-FIRL)
W76-02200

PLASTIC PIPE USE GROWS FOR SEWER MAIN INSTALLATIONS.
The American City and County, Vol 90, No 10, p 84, 86, October, 1975. 1 tab.

Descriptors: *Construction materials, *Sewers, *Pipes, *Plastic pipes, Installations, Surveys, Concrete pipes, Cities.
Identifiers: Vitrified clay pipes.

A survey on construction materials for sewer pipes showed that 19.3% of 1974 installations and an anticipated 18% of the 1975 installations were made with plastic pipe. Mileage of current sewer pipes are listed by type and by size range. The most common inplace sewer pipe material is vitrified clay pipe, followed by reinforced concrete, asbestos concrete, cast iron, and plastic. In recent installations, however, plastic pipe was the second most frequently used type, next to vitrified clay. Annual installations of over 16,500 miles of sewer pipe in the United States are predicted for the next five years, particularly in small cities and in southern and western communities. (Kramer-FIRL)
W76-02202

SEWER AUGERING MACHINE,
L. H. Silverman, A. A. Silverman, and E. T. Goworski.
Canadian Patent 974,010, Issued September 9, 1975. Patent Office Record, Vol 103, No 36, p 3, September, 1975.

Descriptors: *Sewers, *Pipes, *Cleaning, *Patents, Equipment, Plumbing, Waste water treatment.
Identifiers: Plumbing snakes.

A patent has been issued for a plumber snake apparatus that consists of a snake coiled inside of a changeable snake cartridge housed in a cartridge housing. A handgrip at the forward end of the housing is provided for gripping the tool as the snake within the pipe being cleaned is rotated with the housing. When the handgrip is axially displaced rearward, a chuck is automatically actuated to grip the snake and prevent further axial feed. (Orr-FIRL)
W76-02212

STEEL MILL WASTE LINE PROTECTED WITH EPOXIES.
For primary bibliographic entry see Field 5D.

W76-02350

SELECTING AND INSTALLING SYNTHETIC POND LININGS,
Van Scoyco and Wiskup, Inc., Washington, D.C.
J. Kumar, and J. A. Jedlicka.
Chemical Engineering, Vol 80, No 3, p 67-70, 1973. 4 fig, 1 tab, 10 ref.

Descriptors: *Ponds, *Linings, *Protective coatings, Impervious membranes, Plastics, Rubber, Synthetic rubber, Installation, Installation costs.
Identifiers: Selection criteria, Polyvinyl chloride, Polyethylene, Polypropylene, Nylons.

Ponds used for waste disposal, brine evaporation, water storage, drilling mud, or chemical storage can be lined with flexible synthetic membranes to prevent excessive liquid seepage into the ground. Synthetic materials are classified as rubber or plastic. Polyvinyl chloride, natural rubber, butyl rubber, Du Pont Hypalon, polyethylene, chlorinated polyethylene, nylon, neoprene, polypropylene, and ethylene propylene rubber are used. Characteristics of each material are given. Liners should have high tensile strength, be flexible, stretch without failure, have good weatherability, have long life, be immune to microbial attack, have specific gravities above 1, be black to resist ultraviolet rays, have a minimum thickness of 20 mils of uniform composition, be free from imperfections, withstand temperature and other ambient conditions, be easily repaired, and economical. A guide to planning, installing, surfacing, sloping, trenching, laying, joining, and covering is given. Where toxic or polluting chemicals are stored, leak detection systems are suggested. The costs of lining materials vary from 10 cents to 60 cents/sq ft and installation cost varies from 1 cent to 10 cent/sq ft.
W76-02431

8I. Fisheries Engineering

HATCHING SUCCESS OF BLUEBACK-HERRING AND STRIPED-BASS EGGS WITH VARIOUS TIME VS. TEMPERATURE HISTORIES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05C.
W76-02008

AN EVALUATION OF THE RAINBOW TROUT-WARMWATER SPECIES FISHERY IN PARKER CANYON LAKE,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 02H.
W76-02454

CHANGE IN MINNOW POPULATIONS IN A SMALL DESERT STREAM RESULTING FROM NATURALLY AND ARTIFICIALLY INDUCED FACTORS,
Bureau of Reclamation, Denver, Colo. Lower River Basin Research Lab.; and Arizona State Univ., Tempe. Dept. of Zoology.
J. N. Rinne.
Southwester Naturalist, Vol 20, No 2, p 185-195, June 27, 1975. 5 tab, 21 ref.

Descriptors: *Fish populations, *Fish reproduction, *Standing crops, *Ecology, *Fish management, Streams, Fish, Minnows, Creeks, Environmental effects, *Arizona, Streamflow, Spawning, Electro-fishing, Flooding, Biomass.
Identifiers: *Population dynamics, Gila intermedia(Girard), Rhinichthys o. osculus(Girard), Agosia chrysogaster(Girard), Cyprinid, Gila River(Ariz).

Population dynamics and standing crops of nows were examined in a small Upper Soo stream in Arizona between 1969 and 1971. T species of minnows, two native to the wash, intermedia (Girard), and Rhinichthys o. osc (Girard), and one introduced (although nativ Arizona), Agosia chrysogaster (Girard), inhab the stream. When a program was initiated in to establish two rare and endangered cypri into a major tributary of the creek, it was sidered desirable to reduce the large populatio Agosia. Renovation was performed follo removal of numbers of Gila and Rhinichthy electrofishing for return to the stream after de ification., Within a week the native fishes were troduced and the two endangered species rele into the habitat. Agosia, not completely destro immediately began spawning to repopulate creek. This procedure was repeated in Febru 1971. Resultant changes in species composit population structure, and standing crops were amined with reference to renovation and inhe environmental factors. Statistics from yea year, attributable to species hardiness, increa streamflow, and flooding. Consistent yearly terms of change in length, weight, and biomas all three species occurred. Condition (k) did display parallel trends among species. (M Arizona)
W76-02460

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PCB IN WATER, A BIBLIOGRAPHY, VOLU 2.
Office of Water Research and Technolo Washington, D.C.
For primary bibliographic entry see Field 05A.
W76-02371

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VASTE TREATMENT RESEARCH LAB.
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ENTER, CORVALLIS, OREG.
Report to International Joint Commission, United States and Canada, Great Lakes Water Quality,Status of Pertinent EPA Research,
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Hygienic Problems of the Protection of Surface Waters and Modern Technology in Industry, (In Russian),
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- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 6
MARCH 15, 1976

W76-02501 -- W76-03000

cretary of the U.S. Department of the Interior has de-
d that the publication of this periodical is necessary in the
tion of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ted aspects of the life, physical, and social sciences as l as related engineering and legal aspects of the charac-stics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-rch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

SIC IS NOT PRESENTLY IN A POSITION TO PROVIDE PIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-L. Sufficient bibliographic information is given to enable ders to order the desired documents from local libraries other sources.

ected Water Resources Abstracts is designed to serve scientific and technical information needs of scientists, ineers, and managers as one of several planned services he Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the erior and has been designated by the Federal Council for ence and Technology to serve the water resources com-nity by improving the communication of water-related earch results. The Center is pursuing this objective by co-inating and supplementing the existing scientific and tech-al information activities associated with active research investigation program in water resources.

provide WRSIC with input, selected organizations with ve water resources research programs are supported as nters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

STRUCTURE OF LIQUID WATER. III. THERMODYNAMIC PROPERTIES OF LIQUID DEUTERIUM OXIDE,
Cornell Univ., Ithaca, N.Y.
J. C. Owicki, B. R. Lentz, A. T. Hagler, and H. A. Scheraga.
Journal of Physical Chemistry, Vol 79, No 22, p 2352-2361, Oct. 23, 1975. 10 fig, 45 ref, 7 rab.

Descriptors: *Water structure, *Heavy water, Thermodynamics, Water, Molecular structure, Hydrogen bonding, Chemical properties, Isotope studies, Inorganic compounds, Deuterium.

A statistical thermodynamic treatment of a cluster model for liquid water is adapted to deuterium oxide. When compared with the results of the theory for water, the principal thermodynamic quantities for deuterium oxide are fit with slightly less accuracy, but the signs of the isotopic differences in these quantities are predicted correctly. The intermolecular vibrational spectral density of deuterium oxide is calculated (as a function of temperature) from the normal mode vibrational frequencies of the clusters and the distribution of cluster sizes. The theory indicates the occurrence of only very few clusters containing more than six molecules, the same conclusion reached for water. Also, the fraction of loosely bonded noncyclic clusters of deuterium oxide increases with increasing temperature, as was found for water. The results suggest that the energy required to break hydrogen bonds in liquid deuterium may be smaller than that for liquid water. The similarities between the theoretical equilibrium cluster distributions and fractions of unbroken hydrogen bonds for deuterium oxide and water imply that these liquids are structurally similar. Most of the thermodynamic differences between liquid deuterium oxide and water are attributable to isotopic effects on the intra- and intermolecular vibrational frequencies of the water clusters rather than to differences in the structures of the two liquids. (Witt-IPC)
W76-02505

A LOCAL-STRUCTURE MODEL FOR CALCULATION OF LATTICE VIBRATIONS IN LIQUID WATER,
Kansas State Univ., Manhattan.
J. Bandekar, and B. Curnutte.
Journal of Molecular Spectroscopy, Vol 58, No 2, p 169-177, November, 1975. 2 fig, 16 ref, 2 tab.

Descriptors: *Water structure, *Model studies, Heavy water, Structure, Water, Structural models, Vibrations, Ice, Molecular structure, Deuterium, Mathematical models.

The local-structure model of Bryan and Curnutte (cf. Journal of Molecular Spectroscopy, Vol 41, No 3, p 512-533, March, 1972), which treated a single molecule in a rigid cage, has been extended to include a central water molecule and its four nearest neighbors surrounded by a rigid cage of next-nearest neighbors. The influence of the next-nearest neighbors is accounted for by the average forces they exert on the five-molecule local-structure group. With parameters based on water at 25C, calculations are given of the spectra of liquid water and deuterium oxide at 25C and for ice I. The results of the calculations are compared with observed spectra and with recent molecular-dynamics calculations. (Witt-IPC)
W76-02512

2. WATER CYCLE

2A. General

A WATERSHED VOLUME RESPONSE MODEL CONSIDERING CONTRIBUTING AREA,
Arizona Univ., Tucson. Dept. of Watershed Management.
R. T. Patten.
Master of Science Thesis, 1975, 65 p, 8 fig, 9 tab, 34 ref, append.

Descriptors: *Watersheds(Basins), *Runoff forecasting, *Rainfall, *Rainfall-runoff relationships, *Evapotranspiration, *Model studies, Hydrology, Water yield, Watershed management, Infiltration, Rainfall intensity, Runoff, Rainfall disposition, Slopes, Distribution patterns, Synthetic hydrology, Regression analysis, Interception, Storage, Storm runoff, Climatology.
Identifiers: Contributing areas.

The model developed is a function of three parameters; two are measurements of rainfall volume and its distribution with time, and the third is based on the monthly potential evapotranspiration rates of the region and is calculated from historical records. The model is developed with a multiple regression equation that incorporates these 3 parameters into 2 variables and a single expression that considers losses as a result of infiltration, interception, and detention. A measurement of the storm duration is the only additional parameter necessary for that equation. Contributing area, which is a significant parameter, is found to be variable with time depending on climatic conditions of the season. When several watersheds are compared using independent data in the model, their contributing areas vary in response to physical properties of the watersheds, such as soil type and distribution. (Robinett-Arizona)
W76-02523

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona University, Tucson, Dept. of Watershed Management.
W. T. Hanes.
Master of Science Thesis, 1975, 83 p, 17 fig, 8 tab, 32 ref, 3 append.

Descriptors: *Snowmelt, *Precipitation(Atmospheric), *Runoff forecasting, *Simulation analysis, *Probability, Runoff, Snow, Watersheds(Basins), Water yield, Model studies, Simulated rainfall, Computers, Synthetic hydrology, Systems analysis, Rainfall-runoff relationships, Forecasting, Frequency analysis, Statistical methods.
Identifiers: Probability distribution.

This study attempts to develop a long-term forecast technique which will produce as its output a probability distribution of future runoff, rather than a single value as previous techniques have done. A deterministic watershed model is used as the basis of the forecasting technique, in addition to a sequence, event-based stochastic precipitation model to provide daily precipitation data inputs for the watershed model. A number of sets of inputs are run through the watershed model to produce an equal number of predictions of total seasonal runoff. A relative frequency distribution of total seasonal runoff is then plotted to which a probability density function may be fitted. The percent error between the actual mean precipitation received per season and the mean precipitation received per season of the simulated data was approximately 10 percent for all forecast periods. If adequate data is available to optimize and test the watershed model used, then there appear to be no major limitations in using the methodology developed in this report for other areas. A group rather than a sequence-based precipitation model may be more appropriate for application in other regions. (Robinett-Arizona)
W76-02664

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1973.
Australian Water Resources Council Canberra.
Australian Government Publishing Service, Canberra, 1975. 431 p, append.

Descriptors: *Water resources, *Research and development, *Projects, *Australia, Bibliographies, Abstracts, Water sources, Groundwater, Surface waters, Water pollution, Water quality, Data collections, Data processing, Hydrology, Hydraulics, Meteorology.

This Inventory covers research into water resources and directly related matters, and includes research projects in progress during the calendar year 1973, including those completed or proposed to commence during that period. The information included was sought by means of a letter circulated to 300 research units in September 1973. A copy of the letter and the suggested form of return and project classification guide which accompanied the letter is included in Appendix I. For the purpose of the Inventory, a research project is defined as one which is designated to reveal new principles, techniques, or methods, to make comparative studies, or to determine applicability in new situations. The basis of the Inventory is the collection of 'Project Details' which are essentially in the form received from co-operating research units. Projects have been grouped on the basis of the research unit performing the research. Indexes are included by subject, by water resources research categories, by research personnel, and by research institutions. (Sims-ISWS)
W76-02680

REVIEW OF MODELS OF TIDAL WATERS,
Monash Univ., Clayton (Australia), Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W76-02689

THUNDERSTORM PRECIPITATION EFFECTS ON THE RAINFALL-EROSION INDEX OF THE UNIVERSAL SOIL LOSS EQUATION,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
K. G. Renard, and J. R. Simanton.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 47-55, 9 fig, 1 tab, 13 ref.

Descriptors: *Erosion, *Erosion rates, *Thunderstorms, *Southwest, *Rainfall-runoff relationships, Precipitation(Atmospheric), Climatic data, Watersheds(Basins), Precipitation gages.
Identifiers: *Universal soil loss equation, Erosion index.

The Universal Soil Loss Equation (USLE) is widely used for estimating annual and individual storm erosion from field-sized watersheds. Records from a single precipitation gage in climatic areas dominated by thunderstorms can be used to estimate the erosion index (EI) only for the point in question on individual storms or for a specific annual value. Extrapolating the results for more than about a mile leads to serious error in estimating the erosion by the use of the USLE. Short time intervals must be used to obtain an adequate estimate of the EI when using the USLE. The variability of the annual EI can be approximated with a log-normal distribution. All studies indicated that in-

vestigations are needed to facilitate estimating the average annual EI from precipitation data as reported by state climatological summaries for states west of the 104th meridian. Additional work is needed to facilitate estimating the EI value from the precipitation data available in most areas of the Southwest where thunderstorms dominate the rainfall pattern. (McLachlan-Arizona)
W76-02740

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02875

NONPOINT SOURCE MINERAL WATER QUALITY MODEL,
Tennessee Valley Authority, Knoxville. Hydraulic Data Branch.
For primary bibliographic entry see Field 5B.
W76-02922

A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
R. B. Corotis.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 948, $7.00 in paper copy, $2.25 in microfiche. National Science Foundation Report NUCE-ST74-15, December 1974. 177 p, 24 fig, 11 tab, 82 ref, 4 append. NSF Grant GK-37442.

Descriptors: *Model studies, *Thunderstorms, *Hydrology, *Mathematical models, *Stochastic processes, Rainfall, Runoff, Precipitation(Atmospheric), Watersheds(Basins), Streamflow, Regression analysis, Floods, Flood forecasting, Flood plains, Cities, Urban runoff, Probability, Urban hydrology, Urbanization, Computer programs.

The observed behavior of thunderstorm-type activity has been used to formulate a multidimensional stochastic model of the understorm process. The physical model of observed activity was used to describe the process, and probability distributions were assigned to all the variables in the process that might be considered random variables. This model follows the hourly development of storms in terms of thunderstorm clouds and rainfall-producing convective cells. Several different theoretical aspects associated with rainfall and runoff were discussed. A somewhat simplified thunderstorm model was used to derive a probability distribution for instantaneous rainfall. The effect of urbanization on both rainfall and runoff, and a statistical regression analysis relating flood damage to characteristics of the watershed basin, precipitation data, and streamflow data were described. The use of decision theory analysis was illustrated for design when there is uncertainty due to potential flood damage. Computer programs and input data were listed in appendixes. (Sims-ISWS)
W76-02928

CONJUNCTIVE AVAILABILITY OF SURFACE AND GROUND WATER IN THE ALBUQUERQUE AREA, NEW MEXICO: A MODELLING APPROACH,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-02936

ASCE URBAN WATER RESOURCES RESEARCH PROGRAM,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Program.
M. B. McPherson, and G. F. Mangan, Jr.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11445, p 847-855, July 1975. 13 ref, 2 append. OWRTC-5045(No 4224)(3).

Descriptors: *Urban hydrology, *Reviews, *Water resources, *United States, Bibliographies, Comprehensive planning, Programs, Hydraulics, Management, Cities, Research and Development, Urbanization, Planning, Publications.

Since 1967 the ASCE Program has served as the full-time operating arm of the ASCE Urban Water Resources Research Council. The basic purpose of the program is to help establish coordinated long-range research on urban water resources on a national scale. Briefly summarized is the progress made through mid-1974 on research needs assessment, urban water management, translation of research findings into practice, facilitation of urban runoff research, and collaboration and participation in research of local governments and other organizations. Also noted are activities scheduled for 1974-1975. Included are annotated citations of all 28 program reports and technical memoranda. (Terstriep-ISWS)
W76-02939

REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHLY MEAN SUBTRACTION,
Purdue Univ., Lafayette, Ind. Schools of Engineering.
M. L. Kavvas, and J. W. Delleur.
Journal of Hydrology, Vol 26, No 3/4, p 335-353, August 1975. 4 fig, 7 ref, append. OWRT B-036-IND(11).

Descriptors: *Times series analysis, *Runoff, *Rainfall, *Analytical techniques, *Stochastic processes, *Synthetic hydrology, Statistical methods, Seasonal, Model studies, Hydrologic data, Frequency.
Identifiers: *Circularly stationary components, Spectral analysis, ARMA model.

A monthly hydrologic time series, rescaled to obtain a constant variance, has a spectrum which, in turn, has a discrete and a continuous part representing the contributions of the circularly stationary (periodic) and stationary random components, respectively. A spectral representation can be constructed for this mixed spectrum which is observed in monthly runoff and rainfall time series. Seasonal and nonseasonal differencing and monthly mean subtraction methods for the removal of the circularly stationary (periodic) component were analyzed making use of this spectral representation for the case of monthly series. It was shown both analytically and by an example that seasonal differencing removes and nonseasonal differencing effectively reduces the periodicity in the covariance function. Both kinds of differencing greatly distort the original spectrum, wiping out the original spectral contribution at the origin and greatly reducing it near the origin. Fitting an ARMA model with few parameters to the distorted spectrum is almost impossible and the fitted models are impractical for hydrologic simulation since they either yield an infinite variance or are undefined at the spectral origin. Subtraction of monthly means completely removes the periodicity in the covariance but introduces a nonstationarity which is neglibible for practical purposes. This transformed hydrologic series is suitable for generation of synthetic monthly streamflows and rainfalls. (Singh-ISWS)
W76-02944

SEDIMENT YIELD OF SELECTED WATERSHEDS WEST OF THE GREAT PLAINS,
Arizona Univ., Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 2J.
W76-02971

2B. Precipitation

CLIMATES AND VEGETATION PATTERN ACROSS THE MOJAVE/GREAT BASIN DESERT TRANSITION OF SOUTHERN NEVADA,
Cincinnati Univ., Ohio. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W76-02525

VEGETATION OF THE SANTA CATALINA MOUNTAINS, ARIZONA. V. BIOMASS, PRODUCTION AND DIVERSITY ALONG THE ELEVATION GRADIENT,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Ecology and Systematics Section.
For primary bibliographic entry see Field 2I.
W76-02532

AN EXCEPTIONAL DESERT RAINSTORM AT KUFRA, LIBYA,
Centre for Overseas Pest Research, London (England).
D. E. Pedgley.
Weather, Vol 29, No 2, p 64-71, 1974. 4 fig, 14 ref.

Descriptors: *Rainfall, *Meteorology, *Cloudbursts, *Arid lands, Deserts, Synoptic analysis, Meterological data, Weather forecasting, Air masses, Atmospheric physics, Storm structure, Storms, Cloud physics.
Identifiers: *Kurfa(Libya), Inter-tropical conversion zone, Troposphere.

Kufra is a remote group of oases lying in the desert of south-east Libya having an annual average rainfall of about 2 mm and many years having none. On August 25, 1952, there was a rainfall of 11.2 mm. The synoptic processes which led to the storm are described. The available evidence strongly suggests that the remarkable storm at Kufra was associated with an exceptional northward surge of the surface inter-tropical convergence zone to about 24 degrees N, combined with an exceptional occurrence of moist southerly winds in mid-troposphere. Both of these events were very probably consequences of the remarkable westward movement at low latitudes of a small but persistent cyclonic circulation in mid-troposphere across the Near East and north-east Africa. The result was development of deep convective clouds at Kufra followed by a cool downdraft squall and pressure jump. (Robinett-Arizona)
W76-02533

THE DESIGN AND PERFORMANCE OF A 6-CUP ANEMOMETER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 7B.
W76-02553

THE ICE NUCLEATING PROPERTIES OF AN ULTRAFINE AEROSOL OF PURE SILVER IODIDE,
Paris-6 Univ. (France). Laboratoire de Meteorologie.
M.-M. Poc, and M. Roulleau.
Journal of Applied Meteorology, Vol 14, No. 6, p 1146-1150, September 1975. 3 fig, 30 ref.

Descriptors: *Nucleation, *Silver iodide, *Laboratory tests, Aerosols, Cloud seeding, Ice, Crystals, Chemistry of precipitation, Precipitation(Atmospheric), Meteorology.

A silver iodide aerosol was prepared under clean conditions. The method was to react iodine vapor with a silver aerosol in an inert dry atmosphere and in darkness. Great care was taken to avoid contamination form atmosphere air. The ice

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nucleating properties of the ultrafine AgI aerosol obtained were studied in a cloud mixing chamber: The aerosol was found to be strangely inactive for temperatures higher than -20C. At -20 C, the 10-30 angstrom particles produced 2 times 10 to the 14th power ice crystals per gram of AgI. (Sims-ISWS)
W76-02554

SILVER IODIDE AEROSOL PRODUCTION BY A PLATED HOT-WIRE GENERATOR,
Wisconsin Univ., Madison. Dept. of Meteorology.
W. R. Barchet, and R. S. McKenzie.
Journal of Applied Metorology, Vol 14, No. 6, P 1151-1155, September 1975. 6 fig, 1 tab, 14 ref. NSF ESR72-03349.

Descriptors: *Silver iodide, *Nucleation, *Laboratory tests, Aerosols, Generators, Cloud seeding, Ice, Crystals, Condensation, Precipitation(Atmospheric), Meteorology.
Identifiers: Hot-wire generators.

There are requirements for a laboratory source of pure silver iodide aerosol with long-term output stability. Aerosol generation by a powder-coated hot wire is unsatisfactory. A method of filament preparation providing a uniform, tightly bound layer of silver iodide on a nichrome heating filament was presented. Size, condensation activity, and ice nucleation properties of silver iodide particles produced by a plated filament met laboratory needs. Long-term stability of aerosal output was an important added benefit. (Sims-ISWS)
W76-02555

A DIGITIZED RADAR FOR PRECIPITATION MEASUREMENTS AND APPLICATIONS TO HYDROLOGY,
Kansas State Univ., Manhattan. Dept. of Electrical Engineering.
D. R. Hummels.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 067, $3.50 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution Number 170, August 1975. 12 p, 5 fig, 3 ref. OWRT A-167-KAN(1). 14-31-0001-4116.

Descriptors: Precipitation(Atmospheric), Measurement, Radar, Instrumentation, Meteorology, Digital computers, Graphic methods, Storms, Monitoring.
Identifiers: *Radar precipitation measurement, *Radar hydrology, Radar processor, Radar meteorology.

The major objective was to design a digital processor to interface a meteorological radar with an on-line minicomputer and CRI graphic terminal. The resulting system will be used to measure precipitation in real time and to monitor severe storms. The processor is designed to quantitize the radar image into range-azimuth cells and transfer an integrated image intensity for each cell to computer memory. After transfer to memory, the intensity data are converted to precipitation rate and cumulative precipitation by computer software. Capability will also be provided for recalling the image or other data for display on a CRT graphic terminal. For convenience in design and assembly the processor was divided into two units, a video integrator and A/D converter unit and a radar computer interface unit. The general characteristics of these two units are summarized.
W76-02635

THE HISTORICAL POTENTIAL OF SNOWFALL AS A WATER RESOURCE IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3B.
W76-02675

CONTROLLED GENERATION OF LARGE VOLUMES OF ATMOSPHERIC CLOUDS IN A GROUND-BASED ENVIRONMENTAL CHAMBER,
National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center.
H. J. Hettel, R. G. de Pena, and J. A. Pena.
Available from the National Technical Information Service, Springfield, Va 22161. NASA Technical Memorandum TMX-3266, August 1975. 21 p, 13 fig, 1 tab.

Descriptors: *Clouds, *Cloud physics, *Research facilities, Atmosphere, Condensation, Laboratories, Instrumentation, Equipment, Facilities, Research and development, Meteorology.
Identifiers: *Cloud chambers, Cloud generation.

Atmospheric clouds have been generated in a 23,000-cubic-meter environmental chamber as the first step in a two-part study on the effects of contaminants on cloud formation. The program was proposed by Pennsylvania State University's Department of Meteorology and was sponsored jointly by NSF and NASA. The generation procedure was modeled on the terrestrial generation mechanism so that naturally occurring microphysics mechanisms are operative in the cloud generation process. Temperature, altitude, liquid water content, and convective updraft velocity could be selected independently over the range of terrestrially realizable clouds. To provide cloud stability, a cotton muslin cylinder 29.3 meters in diameter and 24.4 meters high was erected within the chamber and continuously wetted with water at precisely the same temperature as the cloud. The improved instrumentation--which permitted fast, precise, and continual measurements of cloud temperature and liquid water content--was described. (Sims-ISWS)
W76-02686

RAIN SCAVENGING OF SO2 AND SULFATE FROM POWER PLANT PLUMES,
Battelle-Pacific Northwest Labs., Richland, Wash. Atmospheric Sciences Dept.
For primary bibliographic entry see Field 5A.
W76-02712

DEVELOPMENT AND TESTING OF A LASER RAIN GAGE,
Colorado State Univ., Fort Collins.
A. D. Ozment.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 185-190, 2 fig, 1 tab, 5 ref.

Descriptors: *Rain gages, *Rainfall, *Distribution patterns *Testing procedures, *Measurement, On-site-tests, Precipitation(Atmospheric), Circulation, Evaporation.
Identifiers: *Laser rain gage.

Current catchment methods of measuring precipitation have several problems which affect their accuracy. The physical presence of the gage disturbs windflow patterns and reduces catch. Other errors of less significance arise from evaporation from the gage, and wetting of the gage. A method is described of measuring precipitation by scattering light from a beam by waterdrops. The sampling medium is a collimated beam from a helium-neon laser. The amount of light scattered is a function of the number and size of drops intercepting the beam. (McLachlan-Arizona)
W76-02752

A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-02928

2C. Snow, Ice, and Frost

FILLING AND EMPTYING SYSTEM FOR ICE HARBOR LOCK, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-02536

METHODS OF AVALANCHE CONTROL ON WASHINGTON HIGHWAYS, FOURTH ANNUAL REPORT,
Washington Univ., Seattle. Dept. of Geophysics; and Washington Univ., Seattle. Dept. of Civil Engineering.
C. B. Brown, R. J. Evans, D. M. McClung, E. R. LaChapelle, and M. B. Moore.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 269, $5.00 in paper copy, $2.25 in microfiche. Washington State Highway Department, Olympia, Research Program Report 8.5, July 1974. 76 p, 27 fig, 2 tab, 21 ref, append.

Descriptors: *Avalanches, *Snow, *Washington, *Highways, Snow cover, Snowpacks, Creep, Forecasting, Weather, Temperature, Mountains, Hazards, Mechanical properties, Surveys.
Identifiers: *Avalanche forecasting, *Cascade Mountains(Wash).

Reports were collected about avalanche conditions and avalanche prevention measures on Washington mountain highways in general and to the North Cascade Highway in particular. Included were various aspects of creep deformation and glide of the snow cover as they affect avalanche defense structure design, reconnaissance of a proposed new highway route through the Cascade Mountains, and a continuing study of the relationship between synoptic winter weather patterns and the formation and distribution of snow avalanches in the Cascades. The reports were entitled: (1) Effect of Glide and Creep on Rigid Obstacles, by C.B. Brown and R.J. Evans; (2) Creep and the Snow-Earth Interface Condition in the Seasonal Alpine Snow-Pack, by D.M. McClung; (3) In-Situ Investigations of the Temperature Dependence of the Creep of Low Density Snow, by D.M. McClung; (4) Naches Tunnel Avalanche Reconnaissance, by E.R. LaChapelle; and (5) Investigation of Synoptic and Surface Weather Situations Leading to Major Avalanche Cycles in the Washington Cascades for the 1973-74 Winter, by M.B. Moore. (Sims-ISWS)
W76-02546

FREEZEUP PROCESSES ON ARCTIC BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
A. D. Short, and W. J. Wiseman, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-003 373, $3.50 in paper copy, $2.25 in microfiche. ARCTIC, Journal of the Arctic Institute of North America, Vol 27, No 3, p 215-224, September 1974. 7 fig, 13 ref. NR 388-110. ONR N00014-69-A-0211-0005.

Descriptors: *Freezing, *Beaches, *Ice, *Alaska, Slush, Berms, Sediments, Coasts, Estuaries, Arctic, Islands, Winter.
Identifiers: *Point Lay(Alaska), *Pingok Island(Alaska), Freezeup processes, Ice-slush berms, Ice-sediment interbedding.

Observations made along the northern Alaskan coast during 1972 served to indicate the processes by which arctic winter beach features are formed. In sub-zero (centigrade) temperatures, ice forms on the surface of brackish lagoonal and estuarine water and is often moved offshore by wind-generated and tidal currents. When waves, wind, and storm surges coincide with the presence of ice in the nearshore zone, the ice and frozen swash mass are deposited contiguously with sediment on the beach as distinctive ice and ice-sediment structures. These structures include ice-slush berms, ice-sediment interbedding, and buried ice boulders. (Sims-ISWS)
W76-02551

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona University, Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-02664

THE HISTORICAL POTENTIAL OF SNOWFALL AS A WATER RESOURCE IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3B.
W76-02675

AN IMPROVED RECORDING GAGE FOR BLOWING SNOW,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Watershed Lab.
For primary bibliographic entry see Field 7B.
W76-02700

COMPUTER SIMULATION OF THE SNOWMELT AND SOIL THERMAL REGIME AT BARROW, ALASKA,
Michigan Univ., Ann Arbor. Dept. of Geography.
S. I. Outcalt, C. Goodwin, G. Weller, and J. Brown.
Water Resources Research, Vol. 11, No. 5, p 709-715, October 1975. 3 fig, 3 tab, 17 ref.

Descriptors: Computer models, *Snowmelt, *Soils, *Alaska, Tundra, Temperature, Model studies, Water supply, Freshwater, Melt water, Snow, Arctic.
Identifiers: *Computer simulation, *Thermal regime, *Barrow(Alaska), Snow-soil simulator, Arctic tundra, Coupled models, Snow ripening, Snowfield, Meltout.

An annual snow-soil simulator for arctic tundra was developed by using coupled models of surface equilibrium temperature and substrate thermal diffusion. Snow ripening, melt, and accumulation were modeled in the simulator which was forced with daily weather data. The simulator predicted that a snow fence array capable of producing drift deeper than 4.2 m would initiate a permanent snowfield at Barrow, Alaska. Such a man-induced snowfield could serve as a reliable source of freshwater for Barrow and similar villages in the north slope region of Asaska. Further analysis indicated that albedo reduction due to dust fall, snow removal, etc., was dominant over aerodynamic effects in producing the early spring meltout observed at Barrow Village. (Roberts-ISWS).
W76-02703

A POSSIBLE RELATION OF ALBEDO TO THE DENSITY AND GRAIN SIZE OF NATURAL SNOW COVER,
Forest Service (USDA), Fort Collins, Colo., Rocky Mountain Forest and Range Experiment Station.
J. D. Bergen.
Water Resources Research, Vol. 11, No. 5, p 745-746, October 1975. 1 fig, 11 ref.

Descriptors: *Albedo, *Density, *Snow cover, *Model studies, Ice, Air, Reflectance, Solar radiation, Cloud cover, Snow, Particle size, Permeability.
Identifiers: Radiant energy, Ice form, Sunlight, Solar spectrum, Solar altitude, Solar energy.

Discussion begins with the fraction of the total solar radiation incident on the snow surface which is absorbed by the snow as sensible heat. A simple model was constructed for this energy, or solar albedo, of natural snow cover. It was based on approximation to the specific surface by a function of grain size and density derived from air permeability tests. Factors which determine solar albedo for a particular snow cover were far from complete. The albedo was found high for a layer of new snow, as high as 91 percent. As the new snow coalesced and coarsened in texture, it fell steadily toward levels of the order of 70 or even 60 percent. It seemed that for grain sizes greater than 1.5 mm, the primary albedo variation was associated with density rather than with grain size. For lower values of grain size, the reverse appeared to be true. (Roberts - ISWS)
W76-02704

BRINE INFILTRATION IN THE MCMURDO ICE SHELF, MCMURDO SOUND, ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. Kovacs, and A. J. Gow.
Journal of Geophysical Research, Vol 80, No 15, p 1957-1961, May 20, 1975. 7 fig, 13 ref.

Descriptors: *Ice, *Brines, *Antarctic, Sea water, Infiltration, Ice-water interfaces, Firn, Glaciers, Snow, Sea ice, Radar, On-site investigations.
Identifiers: *Ice shelves, *McMurdo Ice Shelf, McMurdo Sound.

In recent trials near Hut Point Peninsula an impulse radar profiler was used successfully to monitor the depth characteristics and lateral extent of brine soaking in the McMurdo Ice Shelf. The success of the profiler can be attributed in large part to the significant difference in dielectric properties of dry firn and firn that has become brine soaked by infiltrating seawater. In addition to furnishing continuous trace of the top of the brine layer, the impulse radar profiler has also revealed the existence of cracks, relict brine horizons, and deformational features within the ice shelf. Data tend to favor lateral infiltration of seawater, either through the seaward edge of the ice shelf or via tensile cracks at the bottom of the ice shelf. (Sims-ISWS)
W76-02707

A MODEL OF SIMPLE RAFTING IN SEA ICE,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
R. R. Parmerter.
Journal of Geophysical Research, Vol 80, No 15, p 1948-1952, May 20, 1975. 6 fig, 10 ref. NSF GV-28807.

Descriptors: *Sea ice, *Ice, *Mechanical properties, *Model studies, Mathematical models, Stress, Cold regions, Ice-water interfaces, Ice cover, Ice jams.
Identifiers: *Ice rafting, Ice sheets.

A mechanical model was developed to describe the rafting of ice sheets of equal thickness. Rafting is one of the important deformation mechanisms in thin ice. The model predicted the force required to initiate rafting. This force is an upper bound for the force in pack ice. The model was also used to calculate the bending stress developed by rafting. The stress increases in proportion to the square root of ice thickness. Thus for a given ice strength there is a maximum thickness of ice which can raft without fracturing. For typical young ice properties the calculated value of 17 cm is in good agreement with field observation. (Sims-ISWS)
W76-02708

FREEZE-THAW EFFECTS ON SO TREATED FOR WATER REPELLENCY,
Agricultural Research Service, Phoenix, A Water Conservation Lab.
D. H. Fink, and S. T. Mitchell.
In: Vol 5: Hydrology and Water Resource Arizona and the Southwest, Proceedings of 1975 Meetings of the Arizona Section, Ameri Water Resources Association and the Hydrol Section, Arizona Academy of Science, April 12, 1975, Tempe, Arizona, p 79-85, 1 fig, 4 tal ref.

Descriptors: *Waterproofing, *Freeze-thaw te *Soil texture, *Soil properties, *Water harvesti Water yield, Watersheds(Basins), Runoff.
Identifiers: *Water repellents.

Water can be supplied to many arid areas by h vesting the precipitation that falls on artifica prepared water-repellent soil catchments. T failure, in 1973, of wax-treated water harvest carchment led to this study which indicates t the failure was due to swelling and shrinking of treated soil which caused complete structu breakdown and loss of repellency. The laborato freeze-thaw studies demonstrated that smoother the plot, the less chance of freeze-th damage. Generally, coarser-textured soil c withstand freeze-thaw cycles better than finer-te tured soils. Soil properties, other than textu may also affect resistance to damage by freez thaw cycles. Increasing the repellent applicati rate may improve resistance to breakdow (McLachlan-Arizona)
W76-02743

DESCRIBING SNOWPACKS IN ARIZON MIXED CONIFER FORESTS WITH STORAGE-DURATION INDEX,
Arizona Univ., Tucson. School of Renewab Natural Resources.
M. A. Warren, and P. F. Ffolliott.
In: Vol 5: Hydrology and Water Resources i Arizona and the Southwest, Proceedings of th 1975 Meetings of the Arizona Section, America Water Resources Association and the Hydrolog Section, Arizona Adademy of Science, April 11 12, 1975, Tempe, Arizona, p 87-89, 1 tab, 9 ref.

Descriptors: *Snowpacks, *Water yield, *Runoff *Snow management, *Coniferous forests *Arizona, Snow melt, Vegetation effects, Mixe forests, Forest management, Surface drainage.
Identifiers: *Snow storage.

The quantification of snowpacks in relation to in ventory-prediction may be useful in the develop ment of water yield improvement practices involv ing vegetation management in the mixed conife forests in Arizona. While mixed conifer forests are relatively limited in extent in Arizona, the potential for water yield improvement by manipulation of snow storage through vegetation management may be high. Sample points on the North Fork of Thomas Creek showed high initial snow storage followed by slow melt in association with low forest densities, low potential insolation values, and high elevation. Sample points exhibiting these conditions also possessed maximum storage-duration index values. Low initial snow storage followed by rapid melt was associated with high forest densities, high potential insolation values, and low elevations. (McLachlan-Arizona)
W76-02744

AERIAL SNOWPACK MAPPING,
Salt River Project, Phoenix, Ariz.
W. L. Warskow.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology

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ection, Arizona Academy of Science, April 11-2, 1975, Tempe, Arizona, p 207-213, 1 ref.

escriptors: *Snowpacks, *Snow surveys, *Snow anagement, *Snow cover, *Mapping, Snow, elt water, Snowmelt, Runoff, Snowfall, /atershed management, Aerial photography, On-te investigations.
dentifiers: Maricopa County(Ariz), Salt River roject.

rizona's continued growth and development de-ends upon sound management of water esources, especially melted snow which is the pri-ary source of water for the 1.1. million residents f Maricopa County. The method for snowpack in-rmation gathering practiced by watershed spe-alists of the Salt River Project in Arizona is escribed. The method is outlined, describing air-aft reconnaissance, direct enroute mapping of xtent and depth of snowpack, and techniques for dentifying ice and/or melt conditions. Under op-mal conditions, this technique is considered more an acceptable for determining snowpack levels. imitations of the technique result from the ob-rver's tolerance of vertigo which can arise under ying conditions; cloud cover, which can reduce ontrast and shadows therby reducing accuracy of bservation; and vegetation zones where density f plant matter screens much of the snow. Michael-Arizona)
/76-02755

IEASURING SNOW COVER FROM ERTS MAGERY ON THE BLACK RIVER BASIN,
rizona Univ., Tucson. School of Renewable /atural Resources.
S. Aul, and P. F. Ffolliott.
n: Vol 5: Hydrology and Water Resources in rizona and the Southwest, Proceedings of the 975 Meetings of the Arizona Section, American /ater Resources Association and the Hydrology ection, Arizona Academy of Science, April 11-2, 1975, Tempe, Arizona, p 215-219, 1 tab, 14 ref.

escriptors: *Snowpacks, *Snow surveys, *Snow anagement, *Arizona, *Snow cover, Remote ensing, Aerial reconnaissance, Satel-tes(Artificial), Mapping.
dentifiers: Black River Basin(Ariz), Earth esources Technology Satellites(ERTS).

he possibility of using imagery from the Earth esources Technology Satellites (ERTS) to moni-or changes in areal snow cover in east-central rizona is examined. Four methods were used in ie interpretation of areal snow cover from the RTS imagery, the Densitometer, Dot Grid, quares Grid and Projection-Planimeter methods roviding results of 69, 71, 72 and 74 percent of eal cover respectively. No one method for in-erpretation of ERTS imagery should be ruled nusable, but any use made of ERTS imagery is ependent upon turn-around time for obtaining the nagery, as snow cover information which cannot e obtained within 24 hours is limited in practical pplication. (Michael-Arizona)
/76-02756

NOWMELT RUNOFF EFFICIENCIES ON RIZONA WATERSHEDS,
orest Service (USDA), Silver City, N. Mex. Gila /ational Forest.
. M. Solomon, P. F. Ffolliott, M. B. Baker, Jr., G. Gottfried, and J. R. Thompson.
vailable from the National Technical Informa-on Service, Springfield, Va 22161 as PB-248 410, 4.50 in paper copy, $2.25 in microfiche. Universi-/ of Arizona, Agricultural Experiment Station, esearch Report 274, Summer 1975. 50 p, 1 ref, ppend. OWRT A-045-ARIZ(4). 14-31-001-5003.

escriptors: *Snowmelt, *Arizona, *Runoff orecasting, *Model studies, *Coniferous forests, /ater supply, Watershed management, /atersheds(Basins), Regression analysis, Forecasting, Vegetation effects, Environmental effects, Soil moisture, Slopes, Elevation.
Identifiers: *Snowmelt fluctuations, *Runoff effi-ciency, Snowpack dynamics.

Snowmelt runoff efficiencies are described for fourteen experimental watersheds in Arizona located in different vegetation zones where snow-melt water yield is a significant contributor to the annual water yield budget. Documentation was based on years of record when on-site snow pack water-equivalent measurements were taken on the watersheds. In an attempt to accomplish the identification of inventory-prediction variables af-fecting snowmelt runoff efficiencies, ten potential variables were assessed on a sub-sample of five experimental watersheds including: (1) forest overstory basal area, (2) forest overstory stems, (3) average watershed slope, (4) average watershed aspect, (5) elevation, (6) drainage densi-ty, (7) antecedent moisture prior to snowpack ac-cumulation, (8) total seasonal precipitation, (9) peak snowpack accumulation, and (10) duration of surface runoff. The regression equation empiri-cally relating snowmelt runoff efficiencies to in-ventory-prediction variables may provide knowledge useful in assessing potential water yield from watersheds. (Barclay-Arizona)
W76-02866

CHARACTERIZATION OF SNOWMELT RU-NOFF EFFICIENCIES,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
R. M. Solomon, P. F. Ffolliott, and D. B. Thorud.
In: Proceedings Symposium on Watershed Management, Operational Watershed Manage-ment: Research to Application, Logan, Utah, Au-gust 11-13, 1975, p 306-326, 1975. 7 fig, 1 tab, 15 ref. OWRT A-045-ARIZ(5). 14-31-001-5003.

Descriptors: *Snowmelt, *Arizona, *Runoff forecasting, Model studies, Forests, Water supply, Regression analysis, Coniferous forests, Watersheds(Basins), Runoff, Forecasting.
Identifiers: *Snowmelt fluctuations, Runoff effi-ciency, Graphical integration technique.

Snow research efforts have been conducted to more fully understand the processes involved in snowpack accumulation, melt, and resultant ru-noff. While many of these efforts have been con-cerned with snowpack dynamics on-site, little work has been directed toward determinations of the portion of a snowpack actually converted into recoverable water. Using runoff efficiency as a descriptor of snowpack depletion-surface relation-ships, three areas of investigation have been ex-plored: the characterization of changing patterns of runoff efficiency within a snowmelt-runoff season, the identification of factors affecting ru-noff efficiency within and among seasons, and the assessment of runoff efficiency patterns from year-to-year among small watersheds. These in-vestigations, coupled with knowledge of snow-pack dynamics on-site, are necessary to prescribe land management systems that will maximize op-portunities for water yield improvement practices. Study areas are from seven small experimental watersheds in the forest zones in Arizona.
W76-02871

USE OF ERTS IMAGERY TO ASSIST IN SNOW-MELT FLOOD PREDICTION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
J. Pennaz, and C. E. Bowers.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 63-80, June 30, 1974. 10 fig. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Snow cover, *Minnesota, Aerial photography, Satel-lites(Artificial), Snow, Water equivalent, Surveys, Floods, Flood forecasting, Snowmelt, Melt water, Runoff forecasting, Data processing, Mathemati-cal models, Models studies.
Identifiers: *ERTS.

In recent years, severe floods have occured in the upper Midwest. One of the primary problems as-sociated with spring flood prediction is the deter-mination of accumulated water content of snow on the ground. ERTS Imagery has been very helpful in drawing water-content-of-snow lines just prior to the spring melt for 1973 and 1974. This should be very valuable in predicting the magnitude of spring floods if the imagery can be provided promptly to flood forecasters in the period February 1 to March 31 each year. As part of the study, a graphical relationship has been developed between 'Per Cent Snow Cover' and 'Water Content of Snow' for the Upper Midwest. This rela-tionship is necessary for the proper use of some modern mathematical simulation models used in flood forecasting. It is difficult to estimate the value of the ERTS Imagery in this study, but flood damage in the upper midwest has exceeded 300 million dollars in 1965 and 1969; anything that can be done to provide warning and prepare emergen-cy countermeasures will make a significant con-tribution to the reduction of such damage. The ERTS Imagery has this capability. (See also W76-02901) (Sims-ISWS)
W76-02906

OPTIMAL HEIGHT OF A DAM FOR PRESER-VATION OF BEARING GROUND IN A FROZEN STATE,
For primary bibliographic entry see Field 8D.
W76-02910

CALCULATION OF ICE-COVER BENDING AL-LOWING FOR VISCOUS PROPERTIES OF ICE,
A. E. IAkunin.
Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as AD-A002 378, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 425, September 1974. 9 p, 1 fig, 4 ref. Translated from Novosibir-skiy Institut Inzhenerov Zheleznodorozhnogo Transporta, Trudy, Vol 79, p 72-82, 1968.

Descriptors: *Ice, *Ice loads, *Bearing strength, *Rheology, Elastic deformation, Elastici-ty(Mechanical), Elastic theory, Mechanical pro-perties, Loads(Forces), Viscosity, Physical pro-perties, Model studies, Mathematical models.
Identifiers: *USSR, *Ice cover strength, Viscoelasticity.

The linear viscoelastic deflections and stresses of a floating ice sheet were considered. Young's modulus was replaced with a Maxwell model in se-ries with a Voight model. The resulting differential equation was solved when the applied load is inde-pendent of time and is linear with time. No numeri-cal results were given but the author said the resulting equations agreed with experiments con-ducted on the Novosibirsk Reservoir. (Sims-ISWS)
W76-02911

CALCULATING SNOW COVER DENSITY IN THE KYZYLCHA MOUNTAIN RIVER BASIN,
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
Yu. B. Sadvakasov, and Ye. M. Kozik.
Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as AD-A002 066, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 415, September 1974. 8 p, 1 fig, 5 tab, 3 ref. Translated from Meteorologiya i Gidrologiya, No 11, p 77-82, 1970.

Descriptors: *Snow, *Snow cover, *Snow sur-veys, Distribution patterns, Watersheds(Basins),

Mountains, Temperature, Precipitation(Atmospheric), Winds, Solar radiation, Snowpacks, Snowmelt, Water sources.
Identifiers: *USSR, *Kyzylcha Mountain River Basin(USSR), Snow density.

All information available on snow cover in the Kyzylcha Mountain River Basin was examined. Connections between density and values of meteorological elements were sought for each month between December and April. In most months, th maximum indluence on density of snow cover is exerted by the sums of positive 13 hr temperatures and the total precipitation computed from 1 December to the day of the snow survey. The results obtained suggested that the calculations of the density of snow cover at the time of its bedding in the region of Kyzylcha Station in about 85% of the cases (and in 90% of the cases in the utilization of meteorological data) have an accuracy adequate for paractical purposes. Sims-ISWS)
W76-02912

DESIGN AND CONSTRUCTION OF HYDRAULIC STRUCTURES ON PERMAFROST,
For primary bibliographic entry see Field 8A.
W76-02913

FREEZING OF AN EARTH DAM FROM THE DRY SLOPE SIDE,
For primary bibliographic entry see Field 8D.
W76-02914

VARIATION OF GEOCRYOLOGICAL CONDITIONS BENEATH DAMS DEPENDING ON UPPER TEMPERATURE LIMITS,
For primary bibliographic entry see Field 8D.
W76-02915

THE SPECTRAL DISTRIBUTION OF LIGHT BENEATH FIRST-YEAR SEA ICE IN THE ARTIC OCEAN,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
G. A. Maykut, and T. C. Grenfell.
Limnology and Oceanography, Vol 20, No 4, p 554-563, July 1975. 7 fig, 27 ref. ONR N00014-67-A-0103-0007.

Descriptors: *Sea ice, *Light, *Solar radiation, *Algae, *Artic Ocean, *Alaska, Ice, Energy, Sea water, Oceans, Aquatic life, Phytoplankton, Photosynthesis, Energy conversion, Primary productivity, Optical properties, Light intensity, Light penetration, Physical properties, Nutrients, Water properties, Spectrophotometry.
Identifiers: First-year sea ice, *Spectral distribution, Spectra transmission data, *Point Barrow(Alaska), Artic ice pack, Transmission properties, Photosynthetic organisms, Submersible spectrophotometer, Melt ponds, White ice, Blue ice, Snow-covered ice.

Spectral transmission data in the 400-1,000-nm range were obtained from about 60 sites beneath first-year sea ice near Point Barrow, Alaka. The amount of energy reaching the ocean depended strongly on the nature of the upper surface. Maximum transmission occurred in the 450-550-nm region, regardless of surface conditions or ice thickness. Initial results were influenced by the presence of interstitial algae in the lower part of the ice. The characteristic signature of these algae was a secondary peak at about 540 nm. Results were generalized to provide estimates of the magnitude and composition of downwelling irradiance beneath the types of ice typically encountered in coastal portions of the Arctic Ocean. (Henley-ISWS)
W76-02923

BUILDING DAMS IN PERMAFROST REGIONS,
For primary bibliographic entry see Field 8D.
W76-02925

FIRST RESULTS OF INVESTIGATIONS OF THE WATER BALANCE IN RIVERS IN THE UPPER KOLYMA BASIN,
For primary bibliographic entry see Field 2E.
W76-02926

PECULIARITIES OF FORMATION OF RUNOFF OF THE UPPER KOLYMA BASIN,
A. S. Kuznetsov, and Sh. S. Nasybulin.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 320, $3.25 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 455, February 1975. 18 p, 8 fig, 4 tab, 8 ref. Translated from Magadan Sbornik Rabot Magadanskoy Gidrometeorologicheskoy Observatorii, No 3, p 52-65, 1970.

Descriptors: *Runoff, *Watersheds(Basins), *Permafrost, Cold regions, Mountains, Evaporation, Precipitation(Atmospheric), Rainfall, Snowfall, Snowmelt, Melt water, Streamflow, Rivers, Talus, Hydrology.
Identifiers: *Kolyma Basin(USSR), *USSR.

The upper Kolyma basin is located in the zone of permafrost where the conditions for formation and regime of runoff are characterized by some singularity. The decisive factor in the formation of river runoff is the quantity of precipitation falling in the territory of the basin. It has been estiablished by a study of the water balance for the rivers of this territory that the formation of runoff is dependent on the underlying surface. The greatest runoff is in rivers whose water collecting basins is covered by talus. Ice encrustations occur frequently in this area; these, however, do not increase runoff, but redistribute it in the course of a year. Where permafrost prevails, the losses of rain and meltwater have a temporary character in the active layer. In the upper Kolyma basin evaporation from the soil varies in the range of 120-170 mm; this is approximately two to three times less than from the soil at the same latitudes in the European territory of the USSR. (Sims-ISWS)
W76-02927

GEOPHYSICAL STUDIES OF FLOATING ICE BY REMOTE SENSING,
Geological Survey, Tacoma, Wash.
W. J. Campbell, W. F. Weeks, R. O. Ramseier, and P. Gloersen.
Journal of Glaciology, Vol 15, No 73, p 305-328, 1975. 15 fig, 54 ref.

Descriptors: *Remote sensing, *Sea ice, *Lake ice, *Analytical techniques, *Microwaves, Infrared radiation, Satellites(Artificial), Icebergs, Data collections.
Identifiers: *ESMR imagery, *Floating ice, Seasonal changes.

This paper presents an overview of remote-sensing techniques as applied to geophysical studies of floating ice. The current increase in scientific interest in floating has occurred during a time of rapid evolution of both remote-sensing platforms and sensors. Mesoscale and macroscale studies of floating ice are discussed under three sensor categories: visual, passive microwave, and active microwave. The specific studies that are reviewed primarily investigate ice drift and deformation, and ice type and ice roughness identification and distribution. (Woodard-USGS)
W76-02954

2D. Evaporation and Transpiration

COMPARATIVE PHOTOSYNTHETIC AND RESPIRATORY GAS EXCHANGE CHARACTERISTICS OF ATRIPLEX LENTIFORMIS (TORR.) WATS. IN COASTAL AND DESERT HABITATS,
State Univ. of New York at Albany. Dept. of Biological Sciences.
R. W. Pearcy, and A. T. Harrison.
Ecology, Vol 55, No 5, p 1104-1111, Late Summe 1974. 6 fig, 1 tab, 20 ref.

Descriptors: *Transpiration, *Photosynthes *Plant physiology, *Respiration, *Air tempe ture, California, Light, Stomata, Phreatophyte Arid climates, Desert plants, Diurnal, Moistu availability, Water loss, Drought tolerance, Pla growth, Plant populations, Ecological distributio Carbon dioxide, Water requirements, Coasts, C mates.
Identifiers: Atriplex lentiformis(Torr) Wats.

A species found in the two different therm regimes of the coastal and desert habitats southern California is Atriplex lentiformis, a lar phreatophytic shrub. This study characterizes th rates of photosynthesis and transpiration of coastal and desert A. lentiformis population und field conditions in an attempt to determine if g exchange characteristics could be found that migl be adaptively related to the differences in habit temperature. The diurnal courses of CO exchange of the coastal and desert shrubs were re markably similar. Maximum CO2 uptake rates an stomatal conductances to water vapor were simila in both habitats, occurring at midday when irrad ance was highest. The optimum temperature fo photosynthesis was 32C for coastal shrubs an 44C for desert shrubs. At temperatures below 36(rates of CO2 uptake were higher in the coasta shrubs, whereas at higher temperatures deser shrubs exhibited a higher rate of CO2 uptake. N evidence of a drought-related midday depressio of photosynthetic rates was present, indicatin that groundwater supplies are apparently adequat for the desert shrubs. (Robinett-Arizona)
W76-02530

A POSSIBLE RELATION OF ALBEDO TO THE DENSITY AND GRAIN SIZE OF NATURAL SNOW COVER,
Forest Service (USDA), Fort Collins, Colo., Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-02704

ASSESSING BARE SOIL EVAPORATION VIA SURFACE TEMPERATURE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, R. J. Reginato, and R. D. Jackson.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 199-205, 5 fig, 19 ref.

Descriptors: *Evaporation, *Transpiration, *Soil moisture, *Soil temperature, Drying, Lysimeters, Soil types, Loam, Thermal properties, Instrumentation, Soil water, Temperature, Arizona.
Identifiers: Phoenix(Ariz).

Evaporation of water from bare soils is an important consideration in the scheduling of many farming operations in both irrigated and dryland agriculture. Accurate predictions of bare soil evaporation can serve as the basis for decisions to increase the acreage planted with a given crop. An alternative is presented to previous approaches to bare soil evaporation estimation by empirically correlating the ratio of daily totals of actual to potential evaporation and the amplitude of the diurnal surface soil temperature wave. Since evaporation is directly related to the surface soil water pressure, the soil thermal inertia technique might be capable of prescribing relative bare soil evaporation rates which, combined with potential evaporation calculations, could allow determination of actual evaporation rates over the entire range of soil drying. (Michael-Arizona)
W76-02754

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SAMPLING SOIL-WATER DISTRIBUTION IN THE SURFACE CENTIMETER OF A FIELD SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-02924

SODIUM RELATIONS IN DESERT PLANTS: 4. SOME PHYSIOLOGICAL RESPONSES OF ATRIPLEX CONFERTIFOLIA TO DIFFERENT LEVELS OF SODIUM CHLORIDE,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3C.
W76-02968

2E. Streamflow and Runoff

A WATERSHED VOLUME RESPONSE MODEL CONSIDERING CONTRIBUTING AREA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-02523

NUMERICAL ERRORS IN WATER PROFILE COMPUTATION,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-02688

TIME SERIES ANALYSIS OF A WATERSHED RESPONSE VARIABLE,
Ottawa University (Ontario). Dept. of Civil Engineering.
K. Adamowski, and M. Oosterveld.
Water resources Research, Vol 11, No 5, p 657-660, October 1975. 3 fig, 2 tab, 7 ref.

Descriptors: *Time series analysis, *Watersheds(Basins), *Correlation analysis, *Recession curves, *Storage, Hydrology, Analytical techniques, Rainfall, Geology, Geomorphology, Storage capacity, Size, Discharge(Water), *Canada.
Identifiers: *Spectral analysis, Ontario(Canada), Spectral density, Watershed response.

The daily mean discharge time series was transformed into a dimensionless time series by dividing the flow by the flow on the following day. This dimensionless time series can be statistically described and a flow generation model can be derived which takes into account the physics of the flow as understood through storage models. The properties of the transformation are such that direct comparisons can be made between different watersheds. The derived time series can be considered as being composed of periodic fluctuations reflecting seasonal changes with superimposed random variations. Various components of time series were studied by correlogram and spectral techniques. Three watersheds with varying size, geology, and physiography were selected for investigation. It was found that in watersheds with low storage capacities, the response to precipitation as observed in the discharge hydrographs is governed largely by precipitation characteristics and has the properties of a random time independent process. Response of the watersheds with high storage capacities is dominated by the watershed's geology and can be considered as a time dependent process. (Singh-ISWS)
W76-02699

THE LOG PEARSON TYPE 3 DISTRIBUTION AND ITS APPLICATION IN HYDROLOGY,
National Inst. of Scientific Research, Quebec.
B., Bobee.
Water Resources Research, Vol. 11 No. 5, p 681-689, October 1975. 3 Fig, 4 tab, 10 ref.

Descriptors: *Distribution patterns, *Flood frequency, *Statistical methods, *Streamflow, *Testing procedures, Analytical techniques, Synthetic hydrology, Methodlolgy, Hydrology, Probability.
Identifiers: *Pearson type 3 distribution, Coefficient of skewness, Coefficient of variation, Logarithmic transformation.

The log Pearson type 3 distribution has found intensive use in hydrology, particularly in flood frequency analysis. A statistical part of this study showed the relationship between the coefficient of varition and the coefficient of skewness and indicated the great variety of forms of the density function. A method was proposed for fitting the distribution to historical flows. It maintains the moments of the observed data but does not preserve those of their logarithms. The technique resembles the one which is already used for the log normal distribution when the parameters are estimated by the method of moments. A comparison by simulation of the different methods available is generally desirable in order to get the best possible fitting method. In particular, the mehtod of maximum likelihood even though it does not lead to sufficient estimates and is elaborate, should be considered. (Singh - ISWS)
W76-02701

STUDY OF TIME-LAPSE PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 4A.
W76-02713

PREDICTING SPRING STREAMFLOW IN CENTRAL ARIZONA,
Oregon State Univ., Corvallis. School of Forestry.
For primary bibliographic entry see Field 4A.
W76-02724

STREAMFLOW HYDROLOGY AND SIMULATION OF THE SALT RIVER BASIN IN CENTRAL ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W76-02731

THE GEOMORPHIC AND HYDRAULIC RESPONSE OF RIVERS,
Colorado State Univ., Fort Collins. Coll. of Engineering.
D. B. Simons.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 21-28, 3 fig, 6 ref.

Descriptors: *Water resources, *Geohydrologic units, *Planning, *Sediments, *Channel flow, *Rivers, Geomorphology, River regulation, Fluvial sediments, Meanders, Analysis.

The importance of water resources and an increasing interest on improvement of out environment have identified the urgent need for methods to predict river response due to various changes resulting from proposed water resource planning. Fluvial geomorphology and hydraulic elements that are related to the interpretation and modeling of response to the problem are presented. Interpretation of alluvial rivers should be preceded by a qualitative analysis and information is presented which should be adequate to carry this out in most cases. This should be followed by a quantitative evaluation of channel response and water sediment routing using theory supplemented by physical and mathematical model studies of the system. (McLachlan-Arizona)
W76-02738

WATERSHED INDICATORS OF LANDFORM DEVELOPMENT,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4D.
W76-02739

VARIATIONS IN THE NATURAL CHEMICAL CONCENTRATION OF RIVER WATER DURING FLOOD FLOWS, AND THE LAG EFFECT: SOME FURTHER COMMENTS,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 5A.
W76-02916

VELOCITY--BED-FORM--TEXTURE PATTERNS OF MEANDER BENDS IN THE LOWER WABASH RIVER OF ILLINOIS AND INDIANA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-02919

HIERARCHICAL ATTRIBUTES AND A UNIFYING MODEL OF BED FORMS COMPOSED OF COHESIONLESS MATERIAL AND PRODUCED BY SHEARING FLOW,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-02920

FIRST RESULTS OF INVESTIGATIONS OF THE WATER BALANCE IN RIVERS IN THE UPPER KOLYMA BASIN,
A. S. Kusnetsov, Sh. S. Nasybulin, and A. I. Ipat'yeva.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-004 006, $3.75 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 454, February 1975. 33 p, 8 fig, 8 tab, 8 ref. Translated from Magadan Sbornik Rabot Magadanskoy Gidrometeorologicheskoy Observatorii, No 2, p 98-121, 1969.

Descriptors: *Water balance, *Watersheds(Basins), *Runoff, Evaporation, Evapotranspiration, Rainfall, Precipitation(Atmospheric), Snowfall, Snowmelt, Vegetation, Streamflow, Mountains, Rocks, Talus, Moisture, Rivers, Water supply, Cold regions, Hydrology.
Identifiers: *Kolyma Basin(USSR), *USSR.

Water balance investigations were conducted for eight water-collecting areas in the upper Kolyma basin during 1967-1968. There is a very definite pattern in the change in individual water balance components and the relationship between them in dependence on the nature of the underlying surface and the extent of the water-collecting areas. There is a very distinct role of talus in the water balance as a factor causing an additional influx of moisture in the river balance. From these investigations the need was determined for developing a method for instrumental determination of evaporation and condensation from talus deposits, measurement of moisture reserves in peaty ground, and measurement of evaporation from the soil applicable to the conditions of continuous occurrence of permafrost. (Sims-ISWS)
W76-02926

PECULIARITIES OF FORMATION OF RUNOFF OF THE UPPER KOLYMA BASIN,
For primary bibliographic entry see Field 2C.
W76-02927

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE REAERATION OF UNIFORM STREAMS,
Mississippi Univ., University. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5G.
W76-02934

TRANSIENT FLOW ROUTING IN CHANNEL NETWORKS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 8B.
W76-02941

ON THE VALUE OF INFORMATION TO FLOOD FREQUENCY ANALYSIS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-02952

LOW STREAMFLOW CHARACTERISTICS,
Geological Survey, Reston, Va.
H. C. Riggs.
Meeting Preprint 2533 for presentation at American Society of Civil Engineers National Convention, held in Denver, Colorado, November 3-7, 1975. 13 p, 5 fig, 7 ref.

Descriptors: *Streamflow, *Low flow, *Flow measurement, *Analytical techniques, Flow characteristics, Low-flow frequency, Gaging stations, Recession curves, Base flow, Streamflow forecasting, Methodology, Groundwater, Inflow.
Identifiers: Ungaged sites.

Low streamflows may be characterized by frequency curves of annual or seasonal minimum flows or by the rate of recession of streamflow during periods of fair weather. The discharge at a specified recurrence interval on the frequency curve is commonly used as a low-flow index for planning and design. At an ungaged site estimates of such index discharges are most reliable when based on a few low-flow discharge measurements at the site. Estimates based on drainage area or other basin characteristics are commonly of low reliability. Low-flow frequency characteristics of regulated streams are more difficult to define unless a long record under the same pattern of regulation is available. Another way of characterizing low flows is by the base-flow recession curve which describes the average rate of recession of groundwater discharge to the stream as modified by evapotranspiration and other factors. These curves are useful in short-term low-flow forecasting. Low-flow characteristics of many streams are available from the U.S. Geological Survey, either in published or unpublished form. (Woodard-USGS)
W76-02955

GEOMORPHIC EVIDENCE FOR LATE HOLOCENE TILTING IN SOUTHERN SAN MATEO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-02960

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-02961

THE BLACK HILLS-RAPID CITY FLOOD OF JUNE 9-10, 1972: A DESCRIPTION OF THE STORM AND FLOOD,
National Weather Service, Silver Spring, Md; and Geological Survey, Reston, Va.
F. K. Schwarz, L. A. Hughes, E. M. Hansen, M. S. Petersen, and D. B. Kelly.
Available from Supt. of Documents, GPO, Wash., D.C. 20402 Price $1.55. Geological Survey Professional Paper 877, 1975. 47 p, 29 fig, 7 tab, 14 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *South Dakota, *Runoff, Streamflow, Rainfall-runoff relationships, Hydrologic data, Stream gages, Flow rates, Peak discharge, Cloudbursts.
Identifiers: *Black Hills-Rapid City(SD), *Record flood(SD).

On June 9, 1972, an almost stationary group of thunderstorms formed over the eastern Black Hills of South Dakota near Rapid City and produced record amounts of rainfall and flood discharges. Nearly 15 in. of rain fell in about 6 hours near Nemo, S. Dak., and more than 10 in. of rain fell over a 60 sq mi area. The resulting floods were the highest ever recorded in South Dakota. At least 18 of the 27 streams where peak flows were computed experienced flows that exceeded the 50-year flood. At least 237 people died in the Black Hills flood and 8 people were still listed as missing 6 months after the flood. Another 3,057 people were injured, and total damage is estimated to have exceeded $160 million. Peak discharge determinations were made at 49 sites. Records show that about 13,000 acre-ft of water flowed through Rapid City during the 2 days of flooding. (Woodard-USGS)
W76-02967

2F. Groundwater

A REVIEW OF THE POTENTIAL APPLICATIONS OF REMOTE SENSING TECHNIQUES TO HYDROGEOLOGICAL STUDIES IN AUSTRALIA,
Newcastle Univ. (Australia). Dept. of Physics.
For primary bibliographic entry see Field 7B.
W76-02534

HAMMER SEISMIC TIMING AS A TOOL FOR ARTIFICIAL RECHARGE SITE LOCATION,
Agricultural Research Service, Fresno, Calif. Water Managment Research.
For primary bibliographic entry see Field 4B.
W76-02556

THE STUDY OF GROUND WATER MOVEMENT IN SELECTED AREAS OF NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
F. J. Schulte.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 076, $5.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo. Completion Report, No WI-221-027-74, Dec 1974. 98 p, 31 fig, 9 tab. OWRT A-023-NDAK(2). 14-31-0001-3034, 14-31-0001-3234, 14-31-0001-3534.

Descriptors: *Groundwater movement, *Groundwater potential, *Hydrogeology, Potentiometric level, *North Dakota, *Base flow, *Flow systems.
Identifiers: Pleistocene sediments, Spiritwood Lake(ND), Pierre Shale, Groundwater chemistry.

The Spiritwood Lake study area is in a generally undulating rolling glacial plain 17 miles north and east of Jamestown, North Dakota. Two large valleys can be distinguished in the bedrock surface of the study area. The Pleistocene sediment of the study area was deposited by glacial, fluvial, lacustrine, and eolian processes. There are two types of groundwater-flow systems in the Spiritwood Lake area, local and intermediate. The local groundwater-flow systems are between adjacent topographic highs and lows. The local flow systems are mostly in till and do not affect the level of Spiritwood Lake appreciably. The intermediate groundwater-flow system occurs along the zone of shattered Pierre Shale between the undisturbed Pierre Shale and the overlying glacial drift. Water in the intermediate flow system moves from northeast to southwest. The level of Spiritwood Lake is controlled by discharge from the intermediate groundwater-flow system.
W76-02628

EFFECTS OF GROUNDWATER SEEPAGE ON STREAM REGIMENT,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W76-02629

PHYSICAL FRAMEWORK OF GROUND WATER OCCURRENCE AND MOVEMENT IN GLACIAL DEPOSITS IN CENTRAL NORTH DAKOTA,
North Dakota Univ., Grant Forks. Dept. of Geology.
For primary bibliographic entry see Field 7C.
W76-02631

GROUNDWATER SEEPAGE AND ITS EFFECT ON SALINE SOILS,
Montana Environmental Quality Council, Helena.
For primary bibliographic entry see Field 2G.
W76-02639

GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 2. AN EVALUATION OF THERMAL WATER IN THE BRUNEAU-GRAND VIEW AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4B.
W76-02655

STIMULATION OF GEOTHERMAL AQUIFERS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-02685

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-02714

APPLICATION OF THE SAGAR METHOD FOR THE SOLUTION OF THE INVERSE PROBLEM IN GROUND-WATER HYDROLOGY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. A. Skrivan.
Master of Science Thesis, 1975, 47 p, 1 fig, 15 tab, 12 ref, 1 append.

Descriptors: *Groundwater movement, *Transmissivity, *Model studies, *Equations, *Testing, *Hydrology, Flow, Groundwater, Pumping, Water storage, Hydraulics, Storage coefficient, Recharge, Discharge(Water), Hydrologic data.
Identifiers: *Sagar method, Inverse problem.

The Sagar method treats parameters as unknowns and the partial derivatives in heads as knowns, using spline-function interpolation and a least-squares optimization technique. This method was tested by employing heads generated in a finite-difference model to try to recover the transmissivity distribution used in the model. Storage coefficient and pumping were assumed known. This paper presents tests on three forms of the transient groundwater flow equation in an attempt to understand the method better and make definitive statements about its applicability. In general, results of the study show that transmissivities are recoverable from finite-difference model head

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put. Central-difference approximations gave ter results than approximations obtained from ne-function interpolation. It is concluded that pite problems with 'surface fitting', the Sagar thod should still be applicable in practical situa-s. Also, assuming the storage coefficient and charge or recharge per unit area are known will ke the inverse problem more tractable. (Mills-zona)
6-02730

E APPLICATION OF STEP-DRAWDOWN MPING TESTS FOR DETERMINING WELL SSES IN CONSOLIDATED ROCK UIFERS,
zona Univ., Tucson. Dept. of Hydrology and ter Resources.
primary bibliographic entry see Field 4B.
6-02747

EMISTRY OF EFFERVESCING GROUND-TER FROM MUNICIPAL WELLS, FLAG-FF, ARIZONA,
thern Arizona Univ., Flagstaff.
primary bibliographic entry see Field 4B.
6-02749

NJUNCTIVE AVAILABILITY OF SURFACE D GROUND WATER IN THE AL-QUERQUE AREA, NEW MEXICO: A DELLING APPROACH,
ne Univ., Orono. Dept. of Civil Engineering.
primary bibliographic entry see Field 4B.
6-02936

MPARATIVE STUDY OF FRESH-SALT TER INTERFACES USING FINITE ELE-NT AND SIMPLE APPROACHES,
th Carolina State Univ., Raleigh. Dept. of Civil ineering.
primary bibliographic entry see Field 2L.
6-02940

DIRECT METHOD FOR THE IDENTIFICA-N OF THE PARAMETERS OF DYNAMIC NHOMOGENEOUS AQUIFERS,
zona Univ., Tucson. Dept. of Systems and In-trial Engineering.
agar, S. Yakowitz, and L. Duckstein.
ter Resources Research, Vol 11, No 4, p 563-August 1975. 3 fig, 1 tab, 31 ref. OWRT C-9(3708)(6). NSF GK-35915.

criptors: *Groundwater, *Anisotropy, ansmissivity, *Estimating equations, *Model ies, Aquifers, Equations, Numerical analysis, teady flow, Aquifer characteristics, Aquifer ems, Confined water, Optimization, Analyti-techniques, Computer models, Mathematical ies.
tifiers: *Inverse problem, *Parameter identifi-on, *Groundwater modeling, nhomogeneous aquifers.

nethod to solve the inverse problem was eloped. This method does not require the itera-solution of the aquifer equation, which is an ntial characteristic of many current identifica-schemes. The shape of the surface represent-the observed dependent variable (which may hydraulic head, chemical concentration, or perature) was approximated from measured ples by means of various interpolation al-thms. Once the various derivatives of the de-lent variable are approximated, the identifica-problem reduces locally to algebraic equations mall dimension. It was shown that aquifer con-ns of general heterogeneity and anisotropy e amenable to this method. Input may be ted as an unknown to be evaluated. The nod was appraised by application to scattered tion points of a simulated solution to a non-ogeneous aquifer equation. (Prickett-ISWS)
-02943

GROUND WATER FOR IRRIGATION IN THE VIKING BASIN, WEST-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W76-02949

DOCUMENTATION OF FINITE-DIFFERENCE MODEL FOR SIMULATION OF THREE-DIMENSIONAL GROUND-WATER FLOW,
Geological Survey, Reston, Va.
P. C. Trescott.
Open-file report 75-438, September 1975. 32 p, 11 fig, 4 tab, 6 append.

Descriptors: *Computer models, *Groundwater movement, *Saturated flow, *Finite element analysis, Dimensions, Aquifers, Hydrogeology, Simulation analysis, Equations, Methodology, Evaluation.
Identifiers: *Strongly implicit procedure, *FORTRAN IV, Three dimensions.

This report emphasizes the theory of the strongly implicit procedure, instructions for using the groundwater-flow model, and practical considerations for application. It also includes an example simulation. The documentation assumes that the reader is familiar with the physics of groundwater flow, finite-difference methods of solving partial-differential equations and the FORTRAN IV language. The porous medium to be simulated may be heterogeneous and anisotropic and have irregular boundaries. The uppermost hydrologic unit may have a free surface. Stress on the system may be in the form of well discharge (or recharge) and recharge from precipitation. The model permits the use of variable grid spacing and uses the strongly implicit procedure for solution of the simultaneous difference equations. One or more layers of nodes can be used to simulate each hydraulic unit. However, if it is reasonable to assume that storage is negligible in a confining bed and that horizontal components of flow can be neglected, the effects of vertical leakage through a confining bed can be incorporated into the vertical component of the anisotropic hydraulic conductivity of adjacent aquifers. (Woodard-USGS)
W76-02962

GROUND-WATER LEVELS IN WYOMING, 1974,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 7C.
W76-02964

EVALUATION OF THE AQUIFER CHARACTERISTICS OF THE BASALTIC TERRAIN OF MAHARASHTRA IN INDIA,
Central Groundwater Board, Nagpur (India).
P. G. Adyalkar, V. V. Rane, V. V. S. Mani, and J. P. Dias.
Proceedings of the Indian Academy of Sciences, Vol 81A, No. 3, p 108-117, March, 1975. 2 fig, 3 tab, 9 ref.

Descriptors: *Aquifer characteristics, *Permeability, *Hydrogeology, *Aquifer testing, *Climates, Aquifer systems, Aquifers, Groundwater, Rock properties, Water yield, Water table, Water wells, Geologic formations, Basalts, Theims equation, Theis equation, Statistical methods, Rainfall, Water table aquifers, Topography.
Identifiers: Maharashtra(India), Bhima basin, Godavari basin, Wardha basin.

Results are presented of aquifer performance tests on select open wells in Bhima, Godavari and Wardha basins of Maharashtra, piercing the water table zone to a depth of 10 to 15 m in an area of 13,000 sq km. Aquifer parameters, including the coefficient of permeability, of the basaltic water table aquifer in different climatic zones depend upon the rainfall, topography, fillings in the vesicles of the vesicular units and the relative compaction of the rock material. The permeability was computed by Theim's formula and the modified Theis non-equilibrium formula. Statistical analysis of the permeability data of the study basins reveals a decrease in permeability range as one goes from the Bhima basin (low rainfall area) through the Godavari basin (assured rainfall area) to the high rainfall area of Wardha basin. Permeability frequency graphs of the 3 basins indicate different hydrogeological characteristics for each. Negative correlation does exist between the climate and hydrogeological characteristics of these domains. (Robinett-Arizona)
W76-02970

2G. Water In Soils

A REVIEW OF THE POTENTIAL APPLICATIONS OF REMOTE SENSING TECHNIQUES TO HYDROGEOLOGICAL STUDIES IN AUSTRALIA,
Newcastle Univ. (Australia). Dept. of Physics.
For primary bibliographic entry see Field 7B.
W76-02534

UNSATURATED HYDRAULIC CONDUCTIVITY DETERMINATION BY A SCALING TECHNIQUE,
San Paulo Univ. (Brazil). Center for Nuclear Energy in Agriculture.
K. Reichardt, P. L. Libardi, and D. R. Nielsen.
Soil Science, Vol 120, No 3, p 165-168, September 1975. 1 fig, 13 ref.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Soil water movement, *Infiltration rates, *Equations, Percolation, Soil moisture , Soil water, Wetting, Moisture content, Nuclear moisture meters, Model studies, Soil moisture meters, Groundwater movement, Permeability, Unsteady flow.
Identifiers: *Wetting front, *Scaling technique, *Tropical soils, *Brazil, Radioactive attenuation.

A scaling technique was presented for estimating the hydraulic conductivity based on experiments of horizontal infiltration of water into an air-dry soil. From plots of the distance from the water source to the wetting front as a function of the square root of time, a scaling factor was obtained that permitted the estimation of the hydraulic conductivity as a function of soil water content. The method was established experimentally using five Brazilian tropical soils and seven California temperate soils, with one of them being taken as a standard soil. Bulk density measurements used to verify the homogeneity of each soil column and volumetric soil water content measurements were made by gamma-attenuation using cesium 137. (Prickett-ISWS)
W76-02558

HEAVY METALS IN WATERS AND SOIL ASSOCIATED WITH SEVERAL PENNSYLVANIA LANDFILLS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5A.
W76-02569

GROUNDWATER SEEPAGE AND ITS EFFECT ON SALINE SOILS,
Montana Environmental Quality Council, Helena.
L. Bahis, and M. R. Miller.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 073, $4.00 in paper copy, $2.25 in microfiche. Research Report No 66, Montana University Joint Water Resources Research Center, Bozeman, October 1975. 39 p, 2 fig, 1 tab, 29 ref. OWRT A-049-MONT(1).

Descriptors: *Saline soils, *Salinity, *Water pollution, *Groundwater, *Montana, *Seepage, Great Plains, Crop production.
Identifiers: *Saline seeps.

Saline seeps are recently developed saline soils in non-irrigated areas that are wet some or all of the time, often with white salt crusts, and where crop or grass production is reduced or eliminated. They are manifestations of 20th century dryland agriculture and the crop-fallow rotation system necessary for moisture conservation and small grain production on the scale practiced in Montana. The widespread occurrence and rapid growth of saline seeps has been recognized as one of the most serious conservation problems in the Northern Great Plains. This report outlines the history of the development of saline deep in Montana and efforts to control it; it describes in detail the hydrogeological setting of the area affected and notes the potential for spreading throughout much of the Northern Great Plains. Environmental aspects and implications of saline seep, including environmental impact and possible control technologies are discussed. (Holje-Montana State)
W76-02639

SULFURIC ACID FOR REDUCING SODIUM HAZARD OF IRRIGATION WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-02666

INFILTRATION CONTROL THROUGH SOIL SURFACE MANAGEMENT,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. M. Dixon.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 543-567, 7 fig, 1 tab, 34 ref, 2 append.

Descriptors: *Infiltration, *Soil surfaces, *Land management, *Hydrostatic pressure, *Permeability, Soil management, Soil physical properties, Cultivated lands, Pore pressure, Equilibrium, Equations, Soil physics, Infiltrometers.
Identifiers: Air-earth interface concept, Effective surface head, Closed-top infiltrometers, Kostiakov's equation.

For most soils, infilitration into a rough, open surface usually exceeds that into a smooth, closed surface by a factor of 10 or more. Infiltration may be controlled over a wide range by designing cultural practices for various levels of surface roughness of openness through suitable tillage or by guiding natural physical and biological processes. This infiltration role, termed 'effective surface head' is defined as the difference between surface water hydrostatic pressure and the soil air back pressure and is expressed as centimeters of water head. In general, water will flow downward displacing the soil air ahead of it when the effective surface head is positive. When it is negative, macropores vent upward the soil air that is being displaced by infiltrating water. When the effective surface head is near zero, static equilibrium is approached. Newly developed closed-top infiltrometers evaluate infiltration responses to natural effective surface heads. A graphing procedure is described which, when used in conjunction with Kostiakov's equation, may be used to predict an infiltration curve. (Mills-Arizona)
W76-02673

SPATIAL VARIABILITY OF WATER RELATED SOIL PHYSICAL PROPERTIES,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering
M. A. Coelho
PhD Dissertation, 1974. 97 p, 17 fig, 17 tab, 49 ref, 3 append.

Descriptors: *Bulk density, *Particle size, *Soil moisture, *Porosity, *Hydraulic conductivity, *Soil analysis, Physical properties, Soil physical properties, Infiltration, Permeability, Soil density, Saturated flow, Soil texture, Soil water movement, Hydrologic properties, Soil classification, Arizona, Statistical methods, Frequency analysis, Sampling, Variability.
Identifiers: *Spatial variation, Pima Clay loam.

The spatial variation of soil parameters is one of the most difficult problems faced withn applying results of localized soil data to large areas, and the inherent variability can be the dominant consideration in determining management practices. This study was performed on an 87 hectare area of Pima Clay loam at the University of Arizona Branch Experiment Station at Marana. The measured parameters showed different patterns of spatial variation (to estimate means within 10% for the 30 cm depth, 5, 51, and 1,011 samples would be required for bulk density, the porosity index, and the saturated hydraulic conductivity, respectively). Values of 15-bar moisture retention corresponding to 500 bulk samples showed a frequency distribution close to the normal with a slight tendency toward skewness. The porosity index showed a nonconsistent distribution pattern at the different depths and a moderately skewed frequency distribution for the composite 180 samples. Close relationships were found between bulk density and percent sand and silt. Particle size distribution exhibited a decrease of silt and clay and a corresponding increase of sand with depth. The porosity index and the saturated hydraulic conductivity tended to increase with depth. Comparison between the sampling scheme used (an unbalanced 3-stage nested design) and 3-stage balanced designs revealed that at least two alternatives would be more effective in decreasing the variance of the mean. (Robinett-Arizona)
W76-02676

PHOSPHORUS SORPTION AND DESORPTION IN CALCAREOUS SOILS FROM ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
L. A. Crisostomo.
Ph.D. Dissertation, 1975. 86 p, 8 fig, 10 tab, 99 ref, 4 append.

Descriptors: *Calcareous soils, *Phosphorus, *Soil chemical properties, *Sorption, Soil types, Calcium compounds, Salts, Acids, Soil management, Fertilizers, *Arizona, Soil-water-plant relationships, Saline soils, Soil physical properties, Agriculture, Acid-base equilibrium, Adsorption, Calcium carbonate.
Identifiers: *Phosphorus sorption isotherm, Sulfuric acid, Avondale soil, Pima soil, Laveen soil, Guest soil, Desorption.

This study examines the applicability of the sorption isotherm procedure in predicting sorption and desorption of P in calcareous soils with and without sulfuric acid amendment. Relationships existing between the P sorption isotherm, yield, and P extracted by sodium bicarbonate and CO2-saturated water were studied. Application of sulfuric acid on four calcareous Arizona soils tended to decrease the soil pH and to increase soluble salts, DTPA extractable iron, NH40Ac extractable aluminum, exchangeable calcium, Al-P fractions, and water soluble P. The adsorption maxima for Avondale, Pima, and Laveen soils were similar (172,167, and 187 micro grams P/g), but that for Guest was much lower (91 micro grams P/g), and was attributed to the low content of calcium carbonate and high content of soluble salts of the Guest soil. When treated with sulfuric acid to neutralize 20 percent acid titratable basicity, all soils tended to desorb P at concentrations of P added for equilibration lower than 5 micro grams/ml (above that value all soils tended to sorb P in amounts higher than the untreated ones, with a low index of bonding energy). Addition and P plus manure tended to shift the isotherm the right due to an increase of P in equilibr solution. (Robinett-Arizona)
W76-02677

MANAGEMENT FOR THE CONTROL SALTS IN IRRIGATED SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water Engineering.
For primary bibliographic entry see Field 3C.
W76-02679

COMPUTER SIMULATION OF THE WOMELT AND SOIL THERMAL REGIME BARROW, ALASKA,
Michigan Univ., Ann Arbor. Dept. of Geograph
For primary bibliographic entry see Field 2C.
W76-02703

ACCURACY OF SOIL WATER BUDGE BASED ON A RANGE OF RELATIONSHI FOR THE INFLUENCE OF SOIL WAT AVAILABILITY ON ACTUAL WATER USE,
University of New England, Armidale (Australi
Dept. of Agronomy.
G. G. Johns, and R. C. G. Smith.
Australian Journal of Agricultural Research, V 26, No 5, p 871-883, September 1975.

Descriptors: *Soil water, *Estimatin *Agriculture, Hydrologic data, Rainfall, Climat Evaporation, Measurement, Storage, Equation Mathematical models, Water utilization.
Identifiers: Available water capacity, Surfa zone, Sensitivity analysis, Prediction, Drylan Computations, Linear function(Linacre Eagleman function, Shaw function, Johns intera tive function, Graphs.

The accuracy of six published functions for deri ing dryland water use from evaporative deman and soil water status was assessed by incorpora ing them in water budgets which were used to est mate dryland soil water status from actual climati records. Budget-derived estimates were compare with values actually measured under improve pastures in the field over an 842-day period. Th root mean square (RMS) of the difference between computed and observed soil water value was used to evaluate the various functions. RM values were found to vary from 8.1 to 29.5 mm fo the functions tested. Soil water estimations mad by using a simple ratio function were generally a good as or better than those made by using mor complex functions. The sensitivity of the variou functions to changes in their input assumption was tested. The results of these tests will facilitat the selection of the optimum functions for condi tions other than those encountered in this study Reduced accuracy of soil water prediction resulte from the use of functions to set water use equal t the potential rate, regardless of the overall dryness of the soil profile, whenever recent rainfall was calculated to have made water available in the sur face zone. (Bell-Cornell)
W76-02715

COMPOSITION AND CONCENTRATION OF SALTS IN SOIL SOLUTIONS OF THE MURGAB OASIS DESERT-MEADOW SOILS UNDER AN CIENT IRRIGATION, (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W76-02732

GROUNDWATER POLLUTION FROM SANITA RY LANDFILL LEACHATE, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W76-02733

LIBRARY U. OF I. URBANA CHAMPAIGN

HUNDERSTORM PRECIPITATION EFFECTS N THE RAINFALL-EROSION INDEX OF THE NIVERSAL SOIL LOSS EQUATION,
gricultural Research Service, Tucson, Ariz. outhwest Watershed Research Center.
or primary bibliographic entry see Field 2A.
76-02740

HE EFFECT OF INCREASING THE ORGANIC ARBON CONTENT OF SEWATE ON ITROGEN, CARBON, AND BACTERIA EMOVAL AND INFILTRATION IN SOIL OLUMNS,
gricultural Research Service, Phoenix, Ariz. ater Conservation Lab.
or primary bibliographic entry see Field 5D.
76-02741

ARIABILITY OF INFILTRATION CHARAC-ERISTICS AND WATER YIELD OF A SEMI RID CATCHMENT,
rizona Univ. Tucson. Dept. of Hydrology and ater Resources.
Nnaji, T. W. Sammis, and D. D. Evans.
: Vol 5: Hydrology and Water Resources in rizona and the Southwest, Proceedings of the 75 Meetings of the Arizona Section, American ater Resources Association and the Hydrology ection, Arizona Academy of Science, April 11-, 1975, Tempe, Arizona, p 67-77, 3 fig, 5 tab, 6 f.

escriptors: *Infiltration, *Runoff, *Infiltration tes, *Watersheds(Basins), *Arizona, Hydrologic operties, Soil-water-plant relationships, Arid nds, Watershed management, Rainfall, Water eld, Pervious soils.
entifiers: Silverbell(Ariz).

pace-time variability in the hydrologic charac-ristics of four major soil series represented in the lverbell validation site was investigated by sam-ing the infiltration characteristics, at randomly lected locations, under several vegetative covers ithin each series. Statistical tests demonstrated at there was not significant difference among the filtration parameters of all the soil-vegetation mbinations. However, the statistically insignifi-nt variations in the parameters produce signifi-nt variations in simulated runoff volumes in-cating the sensitivity of the runoff generating ocess to infiltration characteristics of the soils. IcLachlan-Arizona)
76-02742

REEZE-THAW EFFECTS ON SOILS REATED FOR WATER REPELLENCY,
gricultural Research Service, Phoenix, Ariz. ater Conservation Lab.
or primary bibliographic entry see Field 2C.
76-02743

SSESSING SOIL MOISTURE REMOTELY,
gricultural Research Service, Phoenix, Ariz. ater Conservation Lab.
J. Reginato, S. B. Idso, and R. D. Jackson.
: Vol 5: Hydrology and Water Resources in rizona and the Southwest, Proceedings of the 75 Meetings of the Arizona Section, American ater Resources Association and the Hydrology ction, Arizona Academy of Science, April 11-, 1975, Tempe, Arizona, p 191-198, 4 fig, 12 ref.

escriptors: *Soil moisture, *Moisture content, oil management, *Remote sensing, *Soil oisture meters, Reflectance, Soil surfaces, icrowaves, Soil temperature.

pace-age technology has produced tools which nen turned to earthly pursuits can provide infor-ation on food and fiber production. Soil moisture s the potential for being remotely assessed, and ree techniques for accomplishing this are under udy. Two of the methods, reflectance and ther-mal, are sensitive to the conditions of the bare soil surface. The third technique, microwave emission, appears to have a good potential for assessing soil moisture with depth, because of its greater wavelength. (McLachlan-Arizona)
W76-02753

ASSESSING BARE SOIL EVAPORATION VIA SURFACE TEMPERATURE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2D.
W76-02754

TRITIUM AND DEUTERIUM AS WATER TRACERS IN HYDROLOGIC SYSTEMS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W76-02870

EFFECT OF AN ASPHALT BARRIER ON WATER STORAGE AND DROUGHT PROBABILITY,
Minnesota Univ., St. Paul, Dept. of Soil Science.
For primary bibliographic entry see Field 3B.
W76-02872

NATURE OF WATER-RETAINING FORCES IN MODERATELY WET SOILS OF MEDIUM AND FINE TEXTURE, (IN RUSSIAN),
Agrofizicheskii Mauchno-Issledovateiskii Institut, Leningrad (USSR).
A. M. Globus.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 12: 36-37. Illus. 1974.

Descriptors: Soils, *Podzols, *Chernozems, *Soil-moisture meters, *Moisture content, *Analysis, *Analytical techniques, Soil texture.
Identifiers: Psychrometry, Membrane press method.

Using the membrane press and psychrometric methods, a relationship between the moisture content and chemical potential of water for fine-loamy soddy-podzolic soil and medium-loamy chernozem was determined.--Copyright 1975, Biological Abstracts., Inc.
W76-02900

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Soil Science.
R. H. Rust, and B. H. Gerbig.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 53-62, June 30, 1974. 2 fig, 3 tab, 4 ref. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Saline soils, *Minnesota, Photography, Films, Filters, Surveys, Data processing, Costs, Economics, Soils, Salinity, Soil types, Crops, Crop response, Agriculture.
Identifiers: *Red River Valley(Minn).

During this second year of the investigation of the saline soil problem in the Red River Valley, effort was concentrated on a detailed examination of 1:40,000 scale color and color IR photography taken in early August 1973, along the two 10-mile transects in Kittson County. On a portion of one transect, additional imagery was obtained at a scale of 1:10,000. On the basis of the photo interpretation coupled with ground truth observations, it was concluded that about 65% of the landscape is saline-affected. Photo interpretation of fallow areas (about 20% of the areas) cannot be made with any confidence. Cost figures for 35mm imagery were developed. For areas of 25 to 100 square miles, obtaining 35 mm photography seems the most economical and will be used in subsequent imagery and analysis. (See also W76-02901) (Sims-ISWS)
W76-02905

LINEAR DISPERSION IN FINITE COLUMNS,
Connecticut Agricultural Experiment Station, New Haven.
J.-Y. Parlange, and J. L. Starr.
Soil Science Society of America Proceedings, Vol 39, No 5, p 817-819, September-October 1975. 2 fig, 6 ref.

Descriptors: *Dispersion, *Solutes, *Soil water movement, Profiles, Boundary processes, Equations, Mathematical models, Soil moisture, Pore water, Velocity.
Identifiers: *Soil columns, Miscible displacement, Breakthrough curves, Peclet numbers.

The effect of the finite length of a soil column on the miscible displacement of a solute was analyzed. The boundary condtions at both ends of the column affected the breakthrough curve, while only the boundary condition at the entrance of the column affected the profile within the column to any extent. The interaction between boundary conditions and column length was such that while the breakthrough curve is essentially that given by the standard solution for a semi-infinite column, even for relatively short columns, the concentration profile was greatly affected by the finite length of the soil column. (Visocky-ISWS)
W76-02921

SAMPLING SOIL-WATER DISTRIBUTION IN THE SURFACE CENTIMETER OF A FIELD SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato.
Soil Science, Vol 120, No 4, p 292-294, October 1975. 3 fig, 5 ref.

Descriptors: *Soil moisture, *Soil water, *Evapotranspiration, Soil temperature, Soil analysis, Instrumentation, Sampling, Soil moisture meters, Soil water movement, On-site investigations, Surfaces, Drying.

To delineate the soil-water content in layers as thin as 0.1 cm in the upper centimeter of a field soil, a simple, easily constructed soil sampler was used. Samples were taken every 20 min during one day of soil drying after sprinkling the soil with 0.6 cm of water. The soil in this top centimeter dried fairly uniformly, with the 0- to 0.1-cm layer drying from 0.202 to 0.036 cc/cc in 8 hr. The 0.8- to 1.0-cm layer dried from 0.238 to 0.152 cc/cc in the same period. With the techniques and tools described herein, no difficulty was encountered in distinguishing the soil-water content of one layer from another. (Gibb-ISWS)
W76-02924

HYDRAULIC CONDUCTIVITY CALCULATIONS FOR UNSATURATED STEADY-STATE AND TRANSIENT-STATE FLOW IN SAND,
Florida Univ., Gainesville. Dept. of Soil Science.
A. ELzeftawy, and R. S. Mansell.
Soil Science Society of America Proceedings, Vol 39, No 4, p 599-603 July-August 1975. 5 fig, 2 tab, 25 ref. OWRT A-026-FLA (5).

Descriptors: *Hydraulic conductivity, *Unsaturated flow, *Steady flow, *Unsteady flow, Sands, Moisture content, Soil water movement, Pore pressure, Nuclear moisture meters, Tensiometers, Pressure head, Cores, Laboratory tests, Soil density, Infiltration, Depth, Drainage.
Identifiers: *Suction head.

Using a method employed by Green and Corey (1971), hydraulic conductivity was calculated as a

function of water content for Lakeland fine sand. A gamma ray transmission method for measuring soil water content and a tensiometer-pressure transducer arrangement for measuring soil water suction were also used to experientally determine values of hydraulic conductivity for a similar range of soil water contents in undisturbed soil cores and hand-packed soil columns. Measured and calculated values were in good agreement for steady flow. During transient flow soil water content was observed to be a non-unique function of suction for water desorption, but depended upon the state of flow. Higher water contents were found at a given pressure head during unsteady flow than during steady flow or static equilibrium (zero flow). Graphs of water content versus soil water suction were similar for cases of steady and no-flow conditions. For transient flow, the soil-water pressure depended upon the soil-water content and rate of change of pressure head with time. (Visocky-ISWS)
W76-02932

A FIELD STUDY OF SOIL WATER DEPLETION PATTERNS IN PRESENCE OF GROWING SOYBEAN ROOTS: I. DETERMINATION OF HYDRAULIC PROPERTIES OF THE SOIL,
Minnesota Agricultural Experiment Station, St. Paul.
L. M. Arya, D. A. Farrell, and G. R. Blake.
Soil Science Society of America Proceedings, Vol 39, No 3, p 424-430, May-June 1975. 8 fig, 3 tab, 18 ref. OWRT B-015-MINN (10).

Descriptors: *Hydraulic properties, *Soil water, *Soil properties, Soil moisture, On-site investigations, Laboratory tests, Hydraulic conductivity, Diffusivity, Soils, Soil mechanics, Soil physics, Soil water movement, Agronomy, Water pressure, Soil temperature.
Identifiers: Soil water content, Soil water pressure.

The hydraulic properties of a Waukegan loam profile were determined by field and laboratory procedures. Relationships between pressure and water content obtained in the laboratory were found to be variable at pressures above -100 cm of water. In this range field data were considered more reliable. Hydraulic conductivity in the field was determined from flux and hydraulic-head gradient data. Hydraulic-head gradients were obtained from tensiometric measuremets of pressure at various depths. In the soil profile that was subject to both evaporation and drainage, the position of a downward moving 'zero flux' boundary was determined. Flux across any depth was obtained by integrating the rate of change of water content with time between the 'zero flux' boundary and the depth in question. A modified laboratory technique was used to determine the diffusivity of undisturbed soil cores. Water content vs. distance data were obtained subject to the conditions that evaporation was proportional to the square root of time and the soil core was effectively semi-infinite. A diffusivity equation was used to calculate diffusivity from the water content-distance functions. Diffusivities were converted to conductivities. The 'zero flux' boundary technique greatly reduced the time needed by covered plot methods to obtain conductivities at high soil-water pressures. The laboratory procedure required only about 30 min/sample and gave results that compared favorably to field results. At high water contents and to a depth of 20 cm, field conductivites were slightly lower than laboratory estimates. Below the 20-cm depth, field data tended to be slightly higher. (Sims-ISWS)
W76-02933

PREDICTION OF IMBIBITION IN A HORIZONTAL COLUMN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, and J. Khanji.
Soil Science Society of America Proceedings, Vol 39, No 4, p 613-617, July-August 1975. 7 fig, 13 ref. OWRT B-070-COLO (14). 14-31-0001-3566.

Descriptors: *Soil water movement, *Air, *Diffusivity, *Equations, Approximation method, Unsaturated flow, Porosity, Porous media, Velocity, Soil moisture, Pore pressure, Permeability, Viscosity, Hydraulic conductivity, Model studies, Laboratory tests, Graphical analysis, Numerical analysis.
Identifiers: *Imbibition, Soil columns, Relative permeability.

An approximate analytical solution to the equations of water and air movement in a horizontal porous medium was presented. From the solution for the water content profile, imbibition rates could be predicted as a function of time. A comparison of predicted and experimental imbibition rates showed an excellent agreement. This result is particularly significant because no numerical integration of a differential equation was necessary to obtain the water content profiles and to obtain the imbibition rates. The method of solution required only graphical constructions and integrations of curves simply related to the basic soil characteristics such as capillary head and unsaturated hydraulic conductivity. (Visocky-ISWS)
W76-02935

SOIL MOSITURE DETECTION DEVICE,
W. G. Lohoff.
U.S. Patent No 3,916, 678, 5 p, 11 fig, 1 ref; Official Gazete of the United States Patent ent Office, Vol 940, No 1, p 96, November 4, 1975.

Descriptors: *Patents, *Soil moisture, *Mointure content, *Soil moisture meters, Soil water, Soil physical properties, Porosity, Soil-Water-Plant relationships.

A soil moisture sensor is described which is responsive to the moisture content of the soil in which the plant is growing and which is a direct indication of the plant's sufficiency or need for water. The apparatus includes a prous sensing element that is inserted into the soil and responds to the moisture content of the soil to control a visual indicator of the soil condition. The porous element constitutes an air valve. When the soil is relatively dry, air flows through the porous element to break a small vacuum which activates the indicator. When the soil is wet, air cannot pass through the sensing element and the indicator is not activated. (Sinha-OEIS)
W76-02997

2H. Lakes

ZOOPLANKTON PRODUCTION IN LAKE ONTARIO AS INFLUENCED BY ENVIRONMENTAL PERTURBATIONS,
State Univ. of New York at Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-02502

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 10. VEGETATION OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ., Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W76-02560

EQUILIBRIUM ADSORPTION OF INORGANIC PHOSPHATE BY LAKE SEDIMENTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5C.
W76-02562

MANAGEMENT OF THE BIOLOGICAL RESOURCES OF THE LAKE ONTARIO BASIN
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W76-02617

CONFERENCE ON THE MANAGEMENT OF RECREATIONAL LAKES.
Wisconsin Univ., Madison. Water Resource Center.
For primary bibliographic entry see Field 6B.
W76-02641

A LAKE--HOW DOES IT BEHAVE,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-02644

UPGRADING LAKES--LAKE RENEWAL AND MANAGEMENT TECHNIQUES,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
For primary bibliographic entry see Field 5G.
W76-02645

ALTERNATIVES TO PROTECT AND ENHANCE LAKES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-02648

AN ENVIRONMENTAL LAND PLANNING APPROACH--CASE STUDY, LILY LAKE PROJECT,
Wisconsin Univ., Madison. Environmental Awareness Center.
For primary bibliographic entry see Field 6B.
W76-02649

THE FACTS OF LIFE,
Wisconsin Univ. Center System-Marinette County, Bay Shore. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-02651

LAKES AND WISCONSIN'S FUTURE,
Wisconsin Office of the Governor, Madison. Lieutenent Governor.
For primary bibliographic entry see Field 6E.
W76-02652

CYPRINODON TULAROSA, A NEW CYPRINODONTID FISH FROM THE TULAROSA BASIN, NEW MEXICO,
Michigan Univ., Ann Arbor. Museum of Zoology.
R. R. Miller, and A. A. Echelle.
Southwestern Naturalist, Vol 19, No. 4, p 365-377, January 20, 1975. 3 fig, 4 tab, 24 ref.

Descriptors: *Killifishes, *Freshwater fish, *Fish genetics, *Fish taxonomy, *Lake morphology, Fish, Aquatic animals, *New Mexico, Rio Grande River, Pleistocene Epoch, Geologic time, Geomorphology, Biology, Arid lands, Lake basins, Hydrography.
Identifiers: *Cyprinodon tularosa, White Sands pupfish, Tularosa basin(New Mex.), Lake Otero, Rio Grande Basin, Meristic characters Morphometric characters.

The White Sands pupfish, Cyprinodon tularosa, is described from the Tularosa basin of southern New Mexico (the Pleistocene Lake Otero). Species of Cyprinodon are characteristic inhabitants of isolated waters of the North American desert and have deomostrated their ability to adapt to extreme environments that are often intolerable to other fish life. The presence of this fish in some of

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e remnant springs and creeks of the Tularosa
sin supports the view that there was a pre-
isconsin hydrographic connection to the south
th what is now the Rio Grande basin. The new
ecies, which is a member of the Cyprinodon
riegatus complex, is evidently closest to C.
vinus of western Texas, from which it differs in
rtain meristic and morphometric characters
ch as smaller scales, fewer pelvic rays, and
re gill rakers), female color pattern, and in the
eeding colors of the male. It is believed that both
ecies may have arisen from a C. variegatus-like
ck that invaded the Rio Grande or a precursor
eam and lake system during Pleistocent time.
obinett-Arizona)
76-02668

ATUS MEMORANDUM ON CHRISTMAS
KE WATERSHED.
nnesota Pollution Control Agency, Min-
apolis. Div. of Water Quality.
r primary bibliographic entry see Field 5B.
76-02682

ALYSIS OF THREE YEARS OF COMPLETE-
ELD TEMPERATURE DATA FROM DIF-
RENT SITES OF HEATED SURFACE
SCHARGES INTO LAKE MICHIGAN,
gonne National Lab., Ill.
r primary bibliographic entry see Field 5B.
76-02683

RATIFIED LAKE AND OCEANIC BRINES:
LT MOVEMENT AND TIME LIMITS OF EX-
ENCE,
rthwestern Univ., Evanston, Ill. Dept. of
ological Sciences.
primary bibliographic entry see Field 5B.
6-02696

KE CLASSIFICATION--A TROPHIC
ARACTERIZATION OF WISCONSIN
KES,
sconsin Univ., Madison. Water Resources
ter.
). Uttormark, and J. P. Wall.
ilable from the National Technical Informa-
Service, Springfield, Va 22161 as PB-247 177,
75 in paper copy, $2.25 in microfiche. Environ-
tal Protection Agency, Report EPA-660/3-75-
, June 1975. 165 p, 8 fig, 13 tab, 22 ref, 3 ap-
d. EPA 1BA031. R-801363.

criptors: *Lakes, *Trophic level,
assification, Water quality, Secchi disks, Dis-
ed oxygen, Fishkill, *Wisconsin.
ntifiers: *Lake condition index, *Lake classifi-
on, *Trophic characterization.

design and application of the Lake Condition
ex (LCI) system of classifying lakes are
cribed, and it is demonstrated that lake classifi-
on can be employed as a useful tool by
urce managers for comparing the trophic con-
on of large numbers of lakes. The LCI system
generated when an evaluation of other
ems revealed that most are presently unsuita-
for classifying the vast majority of lakes
use the analytical data required for their use
lacking. Utilizing subjective information, the
system was applied to the classification of
e than 1100 large Wisconsin lakes. Checks of
results show that 86% of the lakes were ap-
riately classified within the limits of the
em; 14% were misclassified, as judged by in-
duals familiar with the lakes in question. Most,
not all, discrepancies were due to erroneous
t data. The LCI values obtained were coupled
nutrient-loading considerations and shoreline
ity-development factors to demonstrate that
classification can serve as a workable data
for lake renewal and management programs.
LCI system is easily modified to incorporate
tional data for special purposes. The system
could be used to classify an estimated 70-80% of the larger lakes in the United States. (EPA)
W76-02764

THE INFLUENCE OF FOOD SUPPLY ON THE MIGRATION PATTERN OF THE TEAL (ANAS CRECCA), (IN GERMAN),
Zoologische Staatssammulung, Munich (West Germany).
J. Reichhoff.
Egretta. 17(1): 4-14. Illus. 1974.

Descriptors: *Common teal, Migration patterns, Migratory birds, Seasonal, Reservoirs, Wetlands, *Food abundance, Food chains.
Identifiers: West Germany, Lake Neusiedl, Lake Constance.

The reservoirs on the lower Inn River in the northern foreland of the Alps between Lake Neusiedl and Lake Constance (West Germany) are the most important wetlands for the passage of teal. In Autum their numbers can reach nearly 5000 individuals. The basis for thic concentration is an abundant food supply in the shallow water zones of the reservoirs. These shallows have been formed in the process of silting of the reservoirs over the past decade. The development of teal stock has closely followed this process. Teal utilize the food supply during autumn in the water of 0-15 cm depth so intensively that a food shortage occurs and the birds are forced to move away before ice formation sets in. Thus, the pattern of migration is strongly influenced by the food supply and the density of teal. The possibility should be taken into account when patterns of migration of this especially adaptable duck species, are evaluated.--Copyright 1975, Biological Abstracts, Inc.
W76-02884

DISTRIBUTION OF MERCURY, CADMIUM, LEAD AND THALLIUM IN A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W76-02898

REMOTE SENSING APPLICATIONS TO HYDROLOGY IN MINNESOTA,
Minnesota Univ., Minneapolis, Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-02907

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
M. Sydor.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 197-240, June 30, 1974. 3 append. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Lake Superior, *Turbidity, *Water quality, Satellites(Artificial), Dissolved solids, Sediment discharge, Erosion, Water pollution sources, Harbors, Dredging, Currents(Water), Great Lakes, Sediments, Sedimentology.
Identifiers: *ERTS.

Correlation of ERTS data with measurements of turbidity and transmittance for water in the Duluth-Superior harbor and the adjacent Lake Superior water was used in production of turbidity maps for the extreme western arem of Lake Superior. Comparison of reflectance of water obtained from ERTS Bands 4, 5, and 6 as a function of suspended solids indicated the possibility of using this data in effluent tracing. Correlation of ground truth with satellite data allowed for extension of results obtained from measurements at few key stations to a large area of the lake. The suspended solids for surface waters of Lake Superior can be measured with better than 20% accuracy. Limitations on the accuracy of the remote sensing measurements establish the lower threshold of detectability of suspended load at 8 mg/1, for the Superior Bay. The three appendixes contain reports detailing the results of these studies. (See also W76-02901) (Sims-ISWS)
W76-02908

REPORT ON INVESTIGATION OF WATER QUALITY OF CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02931

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2J.
W76-02963

SOME LIMNOLOGICAL ASPECTS OF 20 SELECTED LAKES IN EAGAN AND APPLE VALLEY, MINNESOTA,
Geological Survey, St. Paul, Minn.
M. R. Have.
Open-file report 75-528, 1975. 44 p, 7 fig, 24 tab, 13 ref, append.

Descriptors: *Limnology, *Lakes, *Water quality, *Environmental effects, *Minnesota, Urbanization, Data collections, Chemical properties, Biological properties, Physical properties, Sampling, Chemical analysis, Water temperature.
Identifiers: *Eagan(Minn), *Apple Valley(Minn).

Selected physical, chemical, and biological parameters were determined to assess the quality of 20 lakes in the cities of Eagan and Apple Valley, Minn. The lake are eutrophic except Holland and Fish Lakes, which are mesotrophic. Since the late 1950's the communities of Eagan and Apple Valley have undergone suburban growth. Changes in land use and increases in storm-sewer and septic-tank effluents in and around lakes can have a decided effect on nutrient loadings in lakes, resulting in accelerated eutrophication. The lakes with storm sewer inlets show no evidence of being different in quality than the lakes without storm sewer inlets. This may result from all lakes being subjected to overland runoff from the hilly terrain. Hence, it probably makes little difference, as far as nutrient enrichment is concerned, whether the overland runoff enters the lakes directly or through a storm sewer. There are no apparent trends in the data available concerning the quality of the lakes. Data collected from October 1972 to October 1974 are presented. (Woodard-USGS)
W76-02966

MACROFAUNA OF THE STONY BOTTOM OF LAKE GENEVA, (IN FRENCH),
For primary bibliographic entry see Field 5C.
W76-02985

THE PELAGIC ROTATORIA OF THE SEMPACHERSEE WITH SPECIAL REGARD TO THE BRACHIONIDAE AND THE QUESTION OF NUTRITION, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-02993

POPULATION STRUCTURE OF THE DOMINATING BENTHIC ORGANISMS OF LAKE DUSIA: 1. POTAMOTHRIX HAM-

MONIENSIS MICH. IN 1969-1971, (IN RUSSIAN),
Akademiya Nauk Litovssoi SSR, Vilnius. Institut Zoologii i Parazitologii.
A. I. Grigyalis.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai. 4. 77-84, Illus. 1974. (Lith. and Engl. summ.).

Descriptors: *Benthos, Lakes, *Worms, Invertebrates, *Productivity.
Identifiers: *Potamothrix-Hammoniensis, *USSR(Lake Dusia), Dominating species.

In 1966-1971 P. hammoniensis was a dominating species in the zoobenthos of the lake. Three size-groups of species were distinguished: young worms 0.6-1.5 mg weight; immature worms 1.6-3.7 mg weight; sexually mature worms (with clitellum) 3.8-7.0 mg weight. These size-groups occurred throughout the year. The lowest productivity (0.33 g/m2) was in 1967 and the highest (10.74 g/m2) in 1969. Average productivity was 5.32 g/m2.--Copyright 1975, Biological Abstracts, Inc.
W76-02994

2I. Water In Plants

EFFECTS OF RAINFALL AND TEMPERATURE ON THE DISTRIBUTION AND BEHAVIOR OF LARREA TRIDENTATA (CREOSOTE-BUSH) IN THE MOJAVE DESERT OF NEVADA,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
J. C. Beatley.
Ecology, Vol 55, No 2, p 245-261, Early Spring, 1974. 9 fig, 1 tab, 21 ref.

Descriptors: *Rainfall, *Air temperature, *Spatial distribution, *Limiting factors, *Arid lands, Plant physiology, Ecology, *Nevada, Desert plants, Moisture availability, Plant growth, Plant populations, Ecological distribution, Water requirements, Arid climates, Germination, Rainfall disposition.
Identifiers: *Larrea tridenta(Creosote-bush), Mojave desert, Plant density, Nevada Test Site.

The investigations were done at 39 sites with Larrea and 20 sites without Larrea in 8 drainage basins at elevations of 915-1,770 m over a 2,600 sq km area of the Nevada Test Site. Percentage of cover by Larrea follows two patterns of relationship with rainfall: (1) where mean rainfall is low to intermediate, cover is highly correlated with mean annual rainfall and less correlated with elevation, and (2) on sites with high mean rainfall there is a consistently low density of Larrea. In general, in undisturbed communities, the taller the Larrea plants the fewer there are of them. Tall plants (greater than 1m) occur in low density and on sites with high rainfall (mean 160-183 mm). Average extreme minimum air temperatures on all Larrea sites were above 1F and the absolute minimum was -8F. There is no pattern of relationship between maximum temperatures and the distribution of Larrea. Altitudinal and latitudinal limits of Larrea coincide with a maximum mean rainfall of 183 mm, and mean annual rainfall of 160-183 mm appears to be critical to the plant's behavior. Highest germination occurred with 80-150 mm of seasonal rain, and either lower or higher seasonal rainfalls resulted in lower percentages of germinable seeds. (Robinett-Arizona)
W76-02524

CLIMATES AND VEGETATION PATTERN ACROSS THE MOJAVE/GREAT BASIN DESERT TRANSITION OF SOUTHERN NEVADA,
Cincinnati Univ., Ohio Dept. of Biological Sciences
J. C. Beatley.
American Midland Naturalist, Vol 93, No 1, p 53-70, January 1975. 5 fig, 4 tab, 20 ref.

Descriptors: *Desert plants, *Semiarid climates, *Deserts, *Climatic zones, *Air circulation, Vegetation, Climates, Arid climates, Climatology, Plant growth, Plant physiology, *Nevada, Soil-water-plant relationships, Environmental effects, Elevation, Sagebrush, Plant populations, Rainfall, Air temperature, Soil environment, Temporal distribution, Moisture availability, Soil moisture.
Identifiers: Larrea tridentata, Artemisia tridentata, Atriplex confertifolia, Mojave Desert, Great Basin Desert, Vegetation pattern.

The area of transition from the Larrea (creosote bush) vegetation of the Mojave Desert in southern Nevada to the Artemisia (sagebrush) and Atriplex (shadscale) of the Great Basin Desert of central Nevada is described. Causes of climatic patterns in this region and the relationship of these patterns to the vegetation and its pattern across the transition are examined. Plant communities of this transition zone are under primary control of climatic variables. Rainfall increases and temperature decreases as the elevation of the drainage basins increases from south to north. Minimum temperature and maximum rainfall tolerances of Mojave Desert Larrea communities are exceeded across the area of transition as, apparently, are the mean maximum temperature and minimum rainfall tolerances of the Great Basin Artemisia communities. Only Atriplex confertifolia communities cannot be so defined as they occur along topographic gradients in both Mojave and Great Basin Desert climates. Within the basins, the climates and vegetation pattern are primarily under the control of patterns of air circulation and nocturnal cold air accumulations, and secondarily under control of edaphic (soil) factors. (Robinett-Arizona)
W76-02525

PRODUCTIVITY AND FLOWERING OF WINTER EPHEMERALS IN RELATION TO SONORAN DESERT SHRUBS,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
W. L. Halvorson, and D. T. Patten.
American Midland Naturalist, Vol 93, No 2, p 311-319, April 1975, 5 tab, 30 ref.

Descriptors: *Plant physiology, *Plant growth, *Semiarid climates, *Desert plants, *Shrubs, Deserts, *Arizona, Germination, Growth stages, Soil-water-plant relationships, Phenology, Soil moisture, Environmental effects, Flowering, Ecology, Vegetation, Vegetation establishment, Canopy, Elevation, Productivity, Biomass, Biomes, Temporal distribution.
Identifiers: *Sonoran Desert, Cave Creek(Ariz), Winter ephemerals, Sonoran Desert shrubs, Vegetation density.

The Sonoran Desert of North America is characterized by a hot, dry climate, with small mountain ranges and a vegetation of shrubs, small trees, cacti and associated ephemerals. This study attempts to related ephemeral productivity and density to varying densities of shrubs on a Sonoran Desert hill near Cave Creek which lies north of the Salt River in central Arizona. Higher shrub density associated with increased elevation appears to decrease both ephemeral biomass productivity and density, while ephemeral growth is enhanced under a shrub canopy if it is not too dense or low-hanging. Phenology of ephemerals on the desert study site shows early coolseason germination when the soil moisture is relatively high, low tolerance to heat, and early flowering when compared to shrubs and succulents in the same area. (Robinett-Arizona)
W76-02526

THE EFFECT OF DECREASING WATER POTENTIAL ON NET CO2 EXCHANGE OF INTACT DESERT SHRUBS,
Duke Univ., Durham, N.C. Dept. of Botany.
W. R. Odening, B. R. Strain, and W. C. Oechel.
Ecology, Vol 55, No 5, p 1086-1095, Late Summer, 1974. 5 fig, 30 ref.

Descriptors: *Desert plants, *Photosynthesis, *Drought tolerance, *Carbon cycle, *Environmental effects, Plant physiology, Drought resistance, Water requirements, Plant tissues, Phreatophytes, Xerophytes, Transpiration, Temperature control, Climates, Adaptation, Precipitation(Atmospheric), Carbon dioxide.
Identifiers: Water potential, *Net CO2 exchange, Larrea divaricata Cav., Encelia farinosa Gray, Chilopsis linearis Cav.

This study compares the effects of seasonal (in situ) and experimentally-induced drought on three desert shrubs of different growth types: Larrea divaricata Cav., Encelia farinosa Gray, and Chilopsis linearis Cav. Field measurements of water potential and photosynthesis were obtained, and additional experiments were conducted in a transplant garden and under controlled environments in a phytotron. All three species have adapted to the extreme desert conditions in diverse ways which allow maintaining a positive accumulation of carbon dioxide for the longest possible period. Larrea has high protoplasmic tolerance to drought stress and is able to maintain net photosynthesis through long periods of low water potential. Photosynthesis activity in Encelia is prolonged, and water loss reduced, by seasonal and drought-induced leaf variability. Chilopsis is most affected by decreasing water potentials, but xeromorphic leaf tissue augments the phreatophytic habit in maintaining relatively high water potential. A transpiration-retarding mechanism is also hypothesized. (Mills-Arizona)
W76-02529

COMPARATIVE PHOTOSYNTHETIC AND RESPIRATORY GAS EXCHANGE CHARACTERISTICS OF ATRIPLEX LENTIFORMIS (TORR.) WATS. IN COASTAL AND DESERT HABITATS,
State Univ. of New York at Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2D.
W76-02530

QUANTITATIVE STUDIES OF ROOTS OF PERENNIAL PLANTS IN THE MOJAVE DESERT,
California Univ., Los Angeles. Lab of Nuclear Medicine and Radiation Biology.
A. Wallace, S. A. Bamberg, and J. W. Cha.
Ecology, Vol 55, No 5, p 1160-1162, Late Summer, 1974, 2 tab, 8 ref.

Descriptors: *Soil moisture, *Arid lands, *Desert plants, *Root systems, *Biomass, Plant physiology, Plant growth, Root zone, Soil-water-plant relationships, Root development, Moisture availability, Plant tissues, Rain water, *Nevada, Plant pathology, Microenvironment, Deserts, Southwest U.S.
Identifiers: *Mojave Desert, Perennial plants, Rock Valley(Nevada Test Site), Stem biomass, Root biomass.

Studies of rooting habits of desert plants in the western U.S. have shown that the plants generally are not deeply rooted except where rain water accumulates. Root and stem weights were obtained for 10 species of perennial plants in the Rock Valley area of the Nevada Test Site in order to develop methods for determining below-ground biomass under given conditions. High correlation was shown between root and stem weights, with root weight for the total of all plants considered equal to about 45 percent of the sum of stem and root weights. Variations in the root-stem ratio could be due to differential water availability in the microterrain, pruning from wind action and animals, dieback of stems or roots, age of plants, and a host of other factors. The proportion that was root was generally independent of plant size, but there were species differences. For some species, root biomass can be estimated from stem weights for a population within a possible error of

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olus or minus 10 to 20 percent. The data were combined with stem weights by dimension analysis to alculate the below-ground biomass per hectare in he study area. Approximately 1618 kilograms per ectare of roots were present in Rock Valley ogether with 1520 kilograms per hectare stem iomass. (Robinett-Arizona)
V76-02531

EGETATION OF THE SANTA CATALINA MOUNTAINS, ARIZONA. V. BIOMASS, RODUCTION AND DIVERSITY ALONG THE LEVATION GRADIENT,
lew York State Coll. of Agriculture and Life ciences, Ithaca. Ecology and Systematics Section.
. H. Whittaker, and W. A. Niering.
Ecology, Vol 56, No 4, p 771-790, Summer, 1975. 9 g, 4 tab, 83 ref.

Descriptors: *Desert plants, *Mountain forests, Elevation, *Vegetation, *Biomass, Productivity, *Arizona, Mountains, Slopes, opography, Forests, Plant physiology, Plant rowth, Semiarid climates, Soil moisture, Deserts, loisture availability, Climatic zones, Soil-water-lant relationships, Grasslands, Subhumid climates, Humid climates, Precipitation(Atmospheric), Arid climates, Biomes, Ecology, Plant populations, Temporal distribution.
Identifiers: *Santa Catalina Mountains(Ariz), iversity, Woodland.

he study was done on the south slope of the anta Catalina Mountains, located to the northeast f Tucson, Arizona, which bears an uninterrupted egetational gradient from subalpine forest rough woodlands and grasslands to desert. For e elevation gradient, the relation of diversity to oisture is combined with the relation to temperare, from which increasing diversity toward lower evations would be expected. Aboveground omass together with aboveground primary roductivity decreased along the elevation adient from high-elevation forests to desert rassland and deserts. Biomass and production ow a two-slope relation to elevation and robably to precipitation, with a greater decrease om the high-elevation forests to the mid-elevaon woodlands and a less steep decrease from dry oodlands through desert grassland into desert. rid environment communities are surface-limitg, with transpiring surfaces minimized but with gh productive efficiency of those surfaces made ossible by their exposure to relatively full sunght. The forests of the more humid environments e surface-abundant; with sufficient moisture ey have much higher leaf area indices, but roductive efficiency is lower. Vascular plant spees diversity decreases from high-elevation fir rests to pine forests, increases from pine to the pen woodlands, and decreases from dry oodlands through the desert grassland and mountin slope desert to the lower bajada (creosotesh) desert. (Robinett-Arizona)
76-02532

NVIRONMENTAL STATUS OF THE LAKE ICHIGAN REGION, VOLUME 10. VEGETAON OF THE LAKE MICHIGAN DRAINAGE ASIN,
isconsin Univ., Milwaukee. Dept. of Botany.
Stearns, and N. Kobriger.
rgonne National Laboratory Report ANL/ES-, Vol 10, April 1975. 113 p, 11 fig, 5 tab, 157 ref, ppend.

escriptors: *Lake basins, *Lake Michigan, egetation, Watersheds(Basins), Forests, Trees, erbivores, Plant groupings, Revegetation, egetation establishment, Vegetation regrowth, kes, Wetlands, Forest fires.
entifiers: *Plant succession.

e presettlement vegetation of the Lake chigan basin consisted primarily of conifer, hardwood and mixed forests with savanna grassland, shrub, dune, and sedge communities in the wet or dry areas, reflecting the influences of postglacial climate, soil, and disturbance. Settlers disturbed the vegetation by draining wetlands and cutting the forests; extensive fires often followed the logging. By 1920 most of the northern part of the basin had been logged. Crops and second-growth timber have replaced the plants lost to the plow and ax. Northern counties are now reoccupied by northern mesic and xeric forest and aspen-birch stands. With some exceptions, agriculture is confined to the southern half of the Basin, wherein agricultural crops are the dominant plant communities. Along the easter shores in Michigan and in Door County, Wisconsin, the moderating influence of Lake Michigan permits extensive fruit production. The concept of plant succession and several routes by which it may proceed were described, particularly primary succession on dunes and wetlands, and secondary succession on logged or burned forest land, and old fields. (See also W74-09407, W74-13169 and W74-1312) (Sims-ISWS)1)
W76-02560

SUBTROPICAL FRESHWATER SHRIMP MACROBRACHIUM NIPPONENSE (DE HAAN) (PALAEMONIDAE) IN PONDS NEAR MOSCOW, (IN RUSSIAN),
Akademiya Nauk SSSR, Leninggrad. Zoologicheskii Institut.
B. G. Ivanov, and Ya. I. Starobogatov.
Ekologiya. 5(6): 83-85. Illus. 1974.

Descriptors: *Ponds, Subtropic, *Shrimp, *Stocking.
Identifiers: Macrobrachium-Nipponense, Moscow, Palaemonidae, *USSR, Freshwater shrimp.

In the 1960's Moscow aquarists were carthing unique freshwater shrimp in the cooling ponds of a state regional electric power plant. The shrimp was identified as the subtropical species M. nipponense. The shrimp were imported into the Moscow region (Russian SFSR, USSR) in 1960 along with the juveniles of herbivorous fishes (white amur and silver carp) from the Yangtze River (China). The successful introduction of the subtropical shrimp in Moscow waters is explained by the fact that the water temperature in the cooling ponds of the station is generally 10 deg. higher than in ordinary water bodies of the same latitude.--Copyright 1975, Biological Abstracts, Inc.
W76-02590

FEEDING OF TWO FROG SPECIES IN FISHERY PONDS OF THE MORDOVIAN ASSR, (IN RUSSIAN),
Mordovia State Univ., Saransk (USSR).
A. I. Dushin.
Ekologiya. 5(6): 87-90. 1974.

Descriptors: *Frogs, Fisheries, Carp, Fish, Insects, Algae, Mollusks.
Identifiers: Beetle, *Cannibalism, *Feeding, *Lake frogs, Mordovian-ASSR, Rana-Esculenta, Rana-Ridibunda, *USSR.

Data are presented on the feeding of the lake frog Rana ridibunda and edible frog R. esculenta and their tadpoles in carp rearing ponds (Russian SFSR, USSR). Fry of carp and trash fish accounted for about 2% by weight of the food of the frogs. Other components were beetles, insect larvae, tadpoles and young frogs, higher plants, algae and mollusks. Cannilbalism was widespread in the lake frog (45% of the specimens examined).--Copyright 1975, Biological Abstracts, Inc.
W76-02600

VEGETATION RESPONSES TO GRAZING, RAINFALL, SITE CONDITION, AND MESQUITE CONTROL ON SEMIDESERT RANGE,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
D. R. Cable, and S. C. Martin.
US Department of Agriculture Forest Service Research Paper RM-149, July, 1975. 25 p, 17 fig, 6 tab, 11 ref.

Descriptors: *Vegetation establishment, *Rainfall, *Range management, *Mesquite, *Semiarid climates, *Grazing, Vegetation effects, Infiltration, Sheet erosion, Soil surfaces, Vegetation, Grasslands, Erosion control, Crop production, *Arizona, Ranges, Desert plants, Carrying capacity, Grasses, Competition, Productivity.
Identifiers: *Mesquite control, Santa Rita Experimental Range(Ariz), Annual grass, Perennial grass.

A discussion is presented of changes in vegetation during a 10-year period (1957-1966) on semidesert rangelands on the Santa Rita Experimental Range near Tucson, Arizona, as affected by climatic factors, cattle grazing, and the control of velvet mesquite. With an annual average rainfall of 17 inches, average perennial grass production for the study period varied from 352 to 524 pounds/acre. Annual grass production fluctuated much more than perennial grass production, varying from essentially none in 1962, the driest year, to 425 pounds/acre in 1959. The 3 major factors affecting annual grass production included rainfall, mesquite competition, and perennial grass competition. Data indicate little change in mesquite cover during the study period. Mesquite comprised 32 and 38 percent of total three-shrub crown intercept on mesquite-alive pastures, but less than 2 percent on the mesquite-killed pastures. Mesquite control was beneficial in increasing perennial grass cover, thus reducing runoff and sheet erosion. (Robinett-Arizona)
W76-02663

DISTRIBUTION OF FISHES IN THE DOLORES AND YAMPA RIVER SYSTEMS OF THE UPPER COLORADO BASIN,
Utah Cooperative Fishery Unit, Logan.
P. B. Holden, and C. B. Stalnkaker.
Southwestern Naturalist, Vol 19, No. 4, p 403-412, January 20, 1975. 4 fig, 3 tab, 7 ref.

Descriptors: *Freshwater fish, *Colorado River Basin, *Fish reproduction, *Streams, Colorado, Colorado River, Fish, Aquatic animals, Fish conservation, Fish populations, Fish barriers.
Identifiers: Dolores River, Yampa River, *Colorado squawfish(Ptychocheilus lucius), Humpback chub(Gila cypha), Bonytail chub(Gila elegans), Humpback sucker(Xyrauchen texanus), Rare and endangered species.

Fish sampling in Colorado was conducted in the Dolores River in 1971 and the Yampa River system in 1968-71, with emphasis placed on rare and endangered species. Of the eleven species found in the Dolores River, no rare or endangered forms were noted. Twenty-two species collected in the Yampa River system included four rare and endangered forms: Colorado squawfish (Ptychocheilus lucius), humpback chub (Gila cypha), bonytail chub (Gila elegans) and humpback sucker (Xyrauchen texanus). The authors conclude that the Dolores River systems appears to have little importance from the standpoint of preservation of rare and endangered fish species, whereas the Yampa River is very important to the preservation of these fish in the Colorado basin, primarily because all of these rare forms are at least present in small numbers and some are apparently reproducing. In particular, the Yampa system appeared important to reproduction and preservation of Colorado squawfish. (Robinett-Arizona)
W76-02667

AQUATIC VEGETATION OF THE USSR, (IN RUSSIAN),
I. D. Bogdanovskaya-Gienef.
Bot Zh (Leningr), 59(12), 1728-1733, 1974.

Descriptors: *Aquatic plants, Ecology, *Analysis, *Vegetation.
Identifiers: *USSR, *Machrophytes.

This article was found in manuscript form in the personal papers of the late I.D. Bogdanovskaya-Guineneuf and probably dates to the early 1940s. It gives a brief synopsis of the aquatic macrophytic flora of the USSR, ecological factors affecting the distribution of aquatic vegetation, cenotypic characteristics, classification of higher aquatic vegetation, distribution of aquatic macrophytes in bodies of water, successions of vegetation, general patterns of the geographic distribution of higher aquatic vegetation and types of hydroseres.--Copyright 1975, Biological Abstracts, Inc.
W76-02848

A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH RESOURCES TECHNOLOGY SATELLITES, TWENTY-FOUR MONTH PROGRESS REPORT.
Minnesota Univ., Minneapolis. Space Sciences Center.
For primary bibliographic entry see Field 4A.
W76-02901

FOREST DISEASE DETECTION AND CONTROL,
Minnesota Univ., St. Paul. Dept. of Plant Pathology.
D. W. French.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 7-18, June 30, 1974. 2 fig, 3 tab. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Plant diseases, *Trees, Oak trees, Forests, Plant pathology, Diseases, Surveys, Photography, Costs, Cost-benefit ratio, Cost-benefit analysis, Data processing.
Identifiers: Elm trees.

Present techniques for detection of Durch elm disease by means of aerial photography are not satisfactory because of cost in relation to success (42%) of detection. It is feasible to use aerial photography for detecting oak wilt as it costs no more than ground survey, requires less time, and provides an accurate map of the infection centers. Detection of tree diseases from a helicopter is of value in checking on other methods of survey. (See also W76-02901) (Sims-ISWS)
W76-02902

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 4A.
W76-02904

THE EFFECT OF SURFACE DRAINAGE AND SUBSEQUENT STAND CUTTING ON CHANGES OF THE GRASS-MOSS COVER, (IN RUSSIAN),
O. V. Shakhova.
Lesovedenie, 1, 42-48, Illus, 1975.

Descriptors: *Surface drainage, Grasses, *Mosses, *Canopy, Cover crops.
Identifiers: *Grass-moss cover, Phytomass, *Stand cutting.

Surface drainage (ditches 0.4-5 m deep) and subsequent clearing by canopy removal has influenced the condition and composition of the grass-moss cover in Betuletum polytrichosum. Increases of the number of grass species, their abundance, phytomass and degree of coverage are strongly pronounced.--Copyright 1975, Biological Abstracts, Inc.
W76-02956

SODIUM RELATIONS IN DESERT PLANTS: 4. SOME PHYSIOLOGICAL RESPONSES OF ATRIPLEX CONFERTIFOLIA TO DIFFERENT LEVELS OF SODIUM CHLORIDE,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3C.
W76-02968

INFLUENCE OF WATER STRESS ON PARAMETERS ASSOCIATED WITH HERBAGE QUALITY OF PANICUM MAXIMUM VAR. TRICHOGLUME,
Commonwealth Scientific and Industrial Research Organizations, St. Lucia (Australia), Div. of Tropical Agronomy.
J. R. Wilson, and T. T. Ng.
Australian Journal of Agriculture Research, Vol 26, No. 1, p 127-136, January, 1975. 3 fig, 3 tab, 31 ref.

Descriptors: *Moisture stress, *Plant physiology, *Plant growth, *Plant tissues, Drought tolerance, Moisture deficit, Water requirements, Soil-water-plant relationships, Root systems, Leaves, Flowering, Cellulose, Lignins, Fibers(Plants).
Identifiers: *Panicum maximum var. trichoglume, Drying-rewetting cycles, Total laminae, Specific laminae, Dry matter digestibility, Stem elongation, Ontogenetical changes, Cell wall.

Stress was applied to Panicum maximum var. trichoglume as a series of drying and re-wetting cycles, and harvests of total laminae, stem, root, and specific laminae were taken at different times after the start of stress treatment. The dry matter digestibility of the stressed plants compared to control plants was lower in leaves 4, 6, and 8 (counting from the tiller base), similar in total green laminae and in leaves 10 and 12, and high stem and dead laminae. The cell wall content of various tissues of the stressed plants was lower than that of the controls. Water stress delayed stem elongation, flowering, and possibly the normal ontogenetical changes of the leaves. The decrease in dry matter digestiblity in stressed plants was not associated with changes in proportions of cellulose, hemicellulose or lignin, but reflected a decline in digestibility of cell wall material. (Robinett-Arizona)
W76-02969

IMPORTANT ASPECTS OF THE RIVER NURSERY AREAS OF SALMON, (IN NORWEGIAN),
Zoologisk Museum, Oslo (Norway).
A. Lillehammer.
Fauna (Oslo). 28(1): 8-15. Illus. 1975.

Descriptors: River, *Salmon, *Fish food organisms, Environmental effects, Fish diets.

Aspects of the stream life of young salmon, Salmo salar L., are discussed. Food organisms and their response to change, both natural and man-made, in certain environmental factors are mentioned.--Copyright 1975, Biological Abstracts, Inc.
W76-02972

2J. Erosion and Sedimentation

EFFECTS OF GROUNDWATER SEEPAGE ON STREAM REGIMENT,
North Dakota Univ., Grand Forks. Dept. of Geology.
L. Clayton, and S. S. Harrison.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 075, $3.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo. Completion Report No WI-222-007-75, April, 1975. 9 p, 6 fig, 9 ref. OWRT B-004-NDAK(4). 14-01-0001-1040.

Descriptors: *Groundwater, Fluvial sediments, Rivers, Erosion, Sedimentation, *Seepage, Surface-groundwater relationships, Sediment transport, *Flumes, Streambeds, *Sediments.
Identifiers: *Stream competence.

Field observations of a small stream have indicated that seepage of water into or out of a stream may greatly alter stream competence. Theoretically, water seeping through the stream bed exerts a drag on quartz grains that changes stream competence by the factor 1.65/(1.65 - i) where i is the seepage gradient. Experiments in laboratory flumes, however, indicate that seepage through a stream bed, despite its effect on effective grain density, causes no change in competence in gaining streams nor in losing streams that lack a mud seal. Possibly the expected change in competence is partially counteracted by the accompanying changes in form drag and surface drag on the grains. Flume experiments also show that upward seepage reduces the steepness of bed forms and decreases bed roughness, whereas downward seepage steepens the bed forms and increases bed roughness, but these changes appear to be insufficient to cause any measurable change in the slope of the water surface. Downward seepage in the presence of sufficient suspended sediment, however, can lead to the formation of a mud seal on the surface of a stream bed; this results in a great increase of the effective density of the bed sediment and may result in the total elimination of sediment entrainment from the bed.
W76-02629

SCOUR AT BRIDGE WATERWAYS--A REVIEW,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-02684

PARTICLE SIZE DISTRIBUTIONS IN A REGION OF COASTAL UPWELLING ANALYZED BY CHARACTERISTIC VECTORS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W76-02697

THE IMPACT OF SUBURBANIZATION ON FLUVIAL GEOMORPHOLOGY,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-02702

SEDIMENT TRANSPORT FROM BIG SAGEBRUSH WATERSHEDS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-02725

STAGES OF DEVELOPMENT OF GULLIES IN THE WEST,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
B. H. Heede.

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Present and prospective technology for pre-
ng sediment yields and sources, ARE-S-40,
ment-yield Workshop, Oxford, Mississippi,
ember 1972, Proceedings, p 155-161, 5 fig, 2
10 ref.

riptors: *Gullies, *Watershed management,
d forming, *Surface runoff,
morphology, Gully erosion, Headward ero-
Storm runoff, Flow, Snowmelt, Streamflow,
tation effects, Watersheds(Basins), Topog-
y, Sediment yield, Erosion rates, Slopes,
Channels, Rivers, Equilibrium, Ephemeral
ms, Mountains, Arizona, New Mexico,
da, California, Colorado, Hydrology.
ifiers: Colorado Rocky Mountains, Discon-
us gullies, Dynamic equillibrium.

discussion of the development stages of gul-
is based on research conducted in the
ado Rocky Mountain Area, New Mexico,
na, Nevada, and California where ephemeral
s carry flows only at times of severe storm or
snowmelt. They may develop in deserts,
and brush lands, or open forests, changing
time as part of general landform evolution
youthful to old-age stages causing substantial
ences in erosion rates and sediment yields.
ntinuous gullies represent a youthful stage.
unced changes in channel width and bed
as well as channel headward extension,
g to gully fusion, take place during transfor-
n to a continuous gully, the early mature
of development characterized by nick points
e channel bottom. Comparison of hydraulic
etry of gullies with that of rivers suggests
he mature stage should be characterized by
nic equilibrium. Channel vegetation is seen
erting a major influence on gully develop-
The author concludes that watershed
gers would have a useful tool if gully stages
be expressed in terms of erosion rates and
ent yields, but as yet there are insufficient
for quantifying gullies in terms of gully
nics and morphology. (Mills-Arizona)
2727

ERSHED INDICATORS OF LANDFORM LOPMENT,
a State Univ., Tempe.
imary bibliographic entry see Field 4D.
2739

IENT MOTION AND SEDIMENT TRANS-
State Water Survey, Urbana; and Illinois
at Urbana-Champaign. Water Resources
ang.
l of the Hydraulics Division, American
y of Civil Engineers, Vol 99, No HY10,
dings paper No 10067, p 1679-1704, October
1 fig, 2 tab, 26 equ, 41 ref. OWRT B-075-

ptors: *Open channel flow, *Sediment
ort, *Hydraulics, Boundary layers, Flow,
Statistical methods, Water flow, Velocity,
ons, Data collections, *Movement.
iers: *Incipient motion, Formulas, Shields
n.

w of existing literature reveals some disad-
es of using Shields diagram as the criterion
pient motion of sediment particles on an al-
ed. A new criterion based on average flow
, fall velocity, and shear velocity Reynolds
is proposed herein with the supporting
llected by different investigators. This new
n is used to calculate the dimensionless
unit stream power in a dimensionless unit
power equation for sediment transport.
nensionless unit stream power is the ratio
time rate of potential energy expenditure
weight of water and terminal fall velocity
ediment. The concept of unit stream power can be applied to the study of sediment transport despite the existence of different bed configurations. More than 1,000 sets of data from both laboratory flumes and natural streams published by different authors are used to support this dimensionless equation for sediment transport. The data used in determining the criterion for incipient motion cover the hydraulically smooth, transition, and completely rough regimes; data used in verifying the proposed dimensionless unit stream power equation cover diversified conditions with particle size ranging from 0.15 mm to 1.71 mm. The effects of particle size, water temperature, and water depth on the total sediment concentration also are studied. (Bell-Cornell)
W76-02877

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W76-02908

VELOCITY--BED-FORM--TEXTURE PATTERNS OF MEANDER BENDS IN THE LOWER WABASH RIVER OF ILLINOIS AND INDIANA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
R. G. Jackson, II.
Geological Society of America Bulletin, Vol. 86, No. 11, p 1511-1522, November 1975. 18 fig, 3 tab, 36 ref.

Descriptors: *Sediments, *Geomorphology, *Rivers, *Sediment transport, *Velocity, *River beds, *Meanders, River systems, Particle size, Sediment distribution, Sand waves, Dunes, Hydraulics, Illinois, Indiana.
Identifiers: River bed forms, Sediment environment, *Wabash River(Ill Ind), Hydraulic geometry.

Meander bends in the lower Wabash River of Illinois and Indiana display coherent patterns of current velocity, bed topography, lower-regime bed forms, and bed-material size. The upstream reach of a bend is a zone of transition from the reversed hydraulic and sedimentologic conditions of the preceding bend. A downstream shift of the cross-sectional maximum velocity magnitude from the inner (point-bar side) bank to the oter bank defines a transitional zone for velocity magnitude in each bend; in this zone, current velocities are strongest and dunes and sand waves most prominently developed at near-bankfull and higher flows. Similar translations of the cross-sectional maxima of depth, mean size of bed material, and dune height and a reversal in the orientation of spiral flow define a transitional zone for each of these four other parameters in each bend. A given meander bend at any stream discharger shows the following sequence of increasing length of transition zones: spiral flow, depth, velocity magnitude, mean size of bed material, and dune height. Downstream from each transitional zone in a bend, the normal asymmetrical cross-sectional distribution of each papameter defines a fully developed zone for that parameter. In both sharply curved and gently curved bends, fully developed zones for bed-material size do not exist. Sharply curved bends do not contain fully developed zones for velocity magnitude, which in other bends show the strongest velocities and largest dunes at near-bankfull or lower flows, especially if the zone is bypassed by overland flow during higher stream discharges. (Lee-ISWS)
W76-02919

HIERARCHICAL ATTRIBUTES AND A UNIFYING MODEL OF BED FORMS COMPOSED OF COHESIONLESS MATERIAL AND PRODUCED BY SHEARING FLOW,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
R. G. Jackson, II.
Geological Society of America Bulletin, Vol. 86, No. 11, p 1523-1533, November 1975. 1 fig, 6 tab, 97 ref, 1 append.

Descriptors: *Sediments, *Geomorphology, Boundary layers, Turbulence, Dunes, River beds, River systems, Rivers, Particle size, Ripple marks, Sediment distribution, Sediment transport, Sediment-water interfaces, Meanders, Beds, Model studies.
Identifiers: *River bed forms, *Cohesionless materal, Shearing flow, Bed form size, Bed configuration, Sediment environments.

From those bed forms generated by the shearing flow of a fluid and composed of cohesionless granular material, 5 hierarchical attributes are recognized: bed-form size, time span of existnece of individual bed forms or bed configurations, super-positions, flow regime of bed forms in open-channel flows, and the Russian theory of channel process. The first two attributes permit the definition of three fundamental groups of bed forms common to all sedimentary environments dominated by shearing flow. The largest bed forms (macroforms), such as point bars, respond to the geomorphological regime of the environment and are relatively insensitive to changes in fluid-dynamic regime during an individual dynamic event (for example, a flood in a river). A two-zone structural model of turbulent boundary layers provides a genetic framework for the two smaller classes of bed forms. Mesoforms, such as dunes in rivers, respond to flow conditions in the outer zone of the rubulent boundary layer as the flow varies through a dynamic event; their lives scale correspondingly with the duration of that event. The smallest bed forms (microforms), such as current lineations, are governed by the flow structure in the inner zone; their lives are much shorter than the periodicity of dynamic events. These considerations consitute a unifying model of the origin of bed forms. Three essential components of the model (bed-form size, time, and structure of the turbulent boundary layer) are readily measurable by present experimental techniques. (Lee-ISWS)
W76-02920

GEOMORPHIC PROCESSES ACTIVE IN THE SOUTHWESTERN LOUISIANA CANAL, LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
C. A. Whitehurst, and L. N. Doiron.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-15128, $4.00 in paper copy, $2.25 in microfiche. Report RM5, October 1974. 39 p, 10 fig, 2 tab, 58 ref. NASA 19-001-97 and 19-001-024.

Descriptors: *Canals, *Louisiana, *Erosion, *Geomorphology, Wetlands, Marshes, Sediments, Sedimentation, Deposition(Sediments), Tides, Tidal marshes, Tidal waters, Tidal effects, Navigation, Remote sensing, Aircraft, Estuaries.
Identifiers: *Lafourche Parish(La), *Southwestern Louisiana Canal(La).

The canals in the Louisiana coastal marshes were dredged through soft muck that is highly susceptible to erosion. Although they were initially man-made features, the canals are undergoing constant changes, as would any natural morphological form in a dynamic environment. Erosive agents such as boat wakes, tidal currents, wind waves, and wildlife activity have resulted in significant widening and deepening. The Southwestern Louisiana Canal (East-West Canal), was chosen as the study area. Field work, laboratory analyses, and interpretation of infrared color imagery were used to provide data for study. The field work was conducted from May to October of 1973 to quantify the rates or erosion and locate areas of deposition. Erosion is the major process occurring in the Canal, with deposition being evident in only two locations. The erosion is self-perpetuating. The continuous decrease in the slope of the canal banks and the in-

crease in the dispersion of energy is accompanied by an increase in the erosive energy as the tidal prisms increase in size. The ratio of the increase of energy dispersion to the increase of current energy is not known. Erosion rates measured during this study ranged between 0.094 and 2.868 cm per day, but these rates also varied according to bank material and location. The study showed that channel erosion rates progressively increase, with no indications of stabilization. (Sims-ISWS)
W76-02930

EVALUATION OF STOCHASTIC MODELS DESCRIBING MOVEMENT OF SEDIMENT PARTICLES ON RIVERBEDS,
Ecole Polytechnique de Montreal (Quebec); and Geological Survey, Denver, Colo.
P. Todorovic, and C. F. Nordin, Jr.
Journal of Research of the US Geological Survey, Vol 3, No 5, p 513-517, September-October, 1975. 5 fig, 8 ref.

Descriptors: *Sediment transport, *Particle size, *River beds, *Stochastic processes, *Reviews, Evaluation, Model studies.

Various stochastic models have been proposed to describe the movement of sediment particles on the riverbed. This report summarizes the most important theoretical results in this field. The approach adopted is based on the fact that most of the stochastic models are only special cases of a particular kind of random walk on the straight line. (Woodard-USGS)
W76-02959

GEOMORPHIC EVIDENCE FOR LATE HOLOCENE TILTING IN SOUTHERN SAN MATEO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
D. P. Adam.
Journal of Research of the US Geological Survey, Vol 3, No 5, p 613-617, September-October 1975. 3 fig, 11 ref.

Descriptors: *Geomorphology, *Land farming, *Faults(Geologic), *California, Streamflow, Diversion, Alluvium, Geologic time, Geological surveys, Radioactive dating, Channels.
Identifiers: *San Mateo County(Calif), *Land tilting.

Relations between stream channels and alluvial deposits along Bradley Creek and the lower part of Butano Creek in southern San Mateo County, California, suggest that the area has been tilted very recently. Localized swampy conditions supply additional supporting evidence. Radiocarbon dates show that some of the valley alluvium along Butano Creek was deposited no more than 750-800 years ago, and tilting must have occurred since that time. Observations indicate that, at least in the vicinity of Pescardero, tilting is still active. The evidence suggests no particular cause for the tilting, but it may be related to movement on the San Gregorio fault, a branch of the San Andreas fault system that passes through the area. (Woodard-USGS)
W76-02960

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
E. J. Pluhowski.
Type II progress report for Goddard Space Flight Center, July 1, 1974. 4 p.

Descriptors: *Sediment transport, *Tracking techniques, *Aerial photography, *Satellites(Artificial), *Lake Ontario, Inflow, Turbidity currents, Winds, Streamflow, Lake sediments, Erosion, Remote sensing.
Identifiers: *Niagara River, *Turbidity plumes, *Suspended sediment.

Although turbidity plumes in Lake Ontario usually are not visible by satellite imagery during the winter, meterologic and hydrologic events may combine to ensure their detection. The clearly defined Niagara River plume of January 25, 1974, was the result of turbid water entering the river at its source near the eastern end of Lake Erie. A persistent southwest wind and mild temperatures resulted in a pile-up of ice-free but turbid water at the source of Niagara River where the highly colored water entered the river. Upon discharge into Lake Ontario, the Niagara River water appears several shades lighter in tone than the ambient lake water. On February 12, 1974, eastward moving ice flows along the Ontario shoreline were forced to move around the hydraulic barrier created by the Niagara River jet. As a result the Niagara River plume was clearly portrayed by a halo-like band of slush ice borne by wind-driven nearshore currents. (Woodard-USGS)
W76-02963

SEDIMENT YIELD OF SELECTED WATERSHEDS WEST OF THE GREAT PLAINS,
Arizona Univ., Tucson, Dept. of Watershed Management.
C. J. Paskett.
Master of Science Thesis, 1974, 72 p, 18 fig, 7 tab, 48 ref.

Descriptors: *Sediment yield, *Climatic zones, *Rainfall-runoff relationsships, *Great Plains, *Sediment transport, Climates, Deserts, Grasslands, Forests, Runoff, Watersheds, Erosion, Topography, Regression analysis, Forecasting, Mathematical studies, Model studies, New Mexico, California, Oregon, Utah, Washington, Wyoming.

Summarized are the roles of climate and runoff in eroding and transporting sediment from a selected group of large watershed basins in New Mexico, California, Oregon, Utah, Wyoming, and Washington. Annual sediment yields representing a total of 178 data years of 17 watersheds were correlated with climate in four separate regression models. An analysis of the regression equations describes the relative influence of desert, steppe, and forest climates in eroding sediment. The probabilistic models developed provide a forecast of yields and their relative frequency of occurrence. Desert climates produce maximal sediment yields, but those from forest climates were relatively high, thought to be a reaction caused by efficient sediment transport systems associated with mountainous terrain. Results are compared with those of other sediment yield models. (Mills-Arizona)
W76-02971

2K. Chemical Processes

CHRIS APPENDIXES I-VI. (PRELIMINARY SYSTEMS DEVELOPMENT-CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM-CHRIS)
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-02552

OSCILLATOR CIRCUIT FOR PROVIDING A CONDUCTIVITY RATIO OF SEA WATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 7B.
W76-02594

WATER QUALITY DETERMINATION APPARATUS,
Kabushiki Kaisha Meidensha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5A.
W76-02596

INTERACTIONS OF METALS AND SIMP OXYANIONS IN WATER,
North Dakota State Univ., Fargo. Dept. Chemistry.
For primary bibliographic entry see Field 5A.
W76-02633

GEOTHERMAL INVESTIGATIONS IN IDAH PART 2. AN EVALUATION OF THERM WATER IN THE BRUNEAU-GRAND VI AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4B.
W76-02655

ECOLOGICAL RAMIFICATIONS OF SILV IODIDE NUCLEATING AGENT ACCUMU TION IN A SEMI-ARID GRASSLANDS I VIRONMENT,
Colorado State Univ., Fort Collins. Dept. Microbiology.
For primary bibliographic entry see Field 3B.
W76-02665

RESULTS OF SEA SURFACE MAPPING IN T PERU UPWELLING SYSTEM,
San Francisco State Univ., Calif. School of Na ral Sciences.
For primary bibliographic entry see Field 5A.
W76-02698

CHEMISTRY OF EFFERVESCING GROUN WATER FROM MUNICIPAL WELLS, FLA STAFF, ARIZONA,
Northern Arizona Univ., Flagstaff.
For primary bibliographic entry see Field 4B.
W76-02749

FORMATION OF METHYL MERCURY I BACTERIA,
Georgia Univ., Atlanta. Dept. of Food Science.
For primary bibliographic entry see Field 5A.
W76-02812

SELECTION OF THRESHOLD VALUES GEOCHEMICAL DATA USING PROBABILI GRAPHS,
British Columbia Univ., Vancouver. Dept. Geological Sciences.
A. J. Sinclair.
Journal of Geochemical Exploration, Vol 3, No p 129-149, May, 1974. 9 fig, 7 tab, 13 ref.

Descriptors: *Data processing, *Statistic methods, *Probability, *Geochemistry.
Identifiers: *Geochemical data, *Thresho values, *Probability graphs.

A method of choosing threshold values betwee anomalous and background geochemical dat based on partitioning a cumulative probability pl of the data is described. It can be used for an polymodal distribution if sufficient data adequate quality are present so that partitioning feasible. As a rule such distributions for geochem cal data closely approach a lognormal model. grouping of the data values is obtained that can b invaluable in interpretation, and, therefore, potentially more useful than other commo methods. (Hoyle-Vanderbilt)
W76-02892

BIOGEOCHEMICAL EXPLORATION FO TUNGSTEN AT BARRYTOWN, NEW ZEA LAND,
Massey Univ., Palmerston North (New Zealand).
For primary bibliographic entry see Field 5A.
W76-02893

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ROUND-WATER RESOURCES OF AMER-AN SAMOA WITH EMPHASIS ON THE AFUNA-LEONE PLAIN, TUTUILA ISLAND,
ological Survey, Honolulu, Hawaii.
r primary bibliographic entry see Field 4B.
76-02950

FECTS OF ORGANIC SOLUTES ON CHEMI-L REACTIONS OF ALUMINUM,
ological Survey, Menlo Park, Calif.
r primary bibliographic entry see Field 5B.
76-02953

. Estuaries

EASUREMENT AND ANALYSIS OF TEM-RAL VARIATIONS OF SALINITY IN SHAL-W WATER,
val Postgraduate School, Monterey, Calif.
K. Kane, II.
ailable from the National Technical Informa-n Service, Springfield, Va 22161 as AD/A-003 , $5.00 in paper copy, $2.25 in microfiche. M.S. esis, September 1974. 80 p, 33 fig, 2 tab, 18 ref.

scriptors: *Instrumentation, *Conductivity, linity, Temperature, Measurement, Analysis, llow water, On-site investigations, Sea water, ne water, Chemical properties, Water proper-, Oceanography.
ntifiers: Energy density spectra.

four-electrode conductivity instrument was eloped to determine variations of conductivity n ocean environment at a fixed point. A field eriment was conducted in Mission Bay, San go, California. Results indicated that the in-ment functioned properly and accurately lved conductivity microstructure. From con-tivity and associated temperature data, salinity was derived which portrays a well-mixed nity structure. Difficulty with a mismatch of constants between conductivity and tempera-instruments prevented the accurate deter-ation of salinity microstructure, although there evidence that one existed. (Sims-ISWS)
-02542

ALL-CRAFT HARBORS: DESIGN, CON-UCTION, AND OPERATION,
fatt and Nichol, Long Beach, Calif.
primary bibliographic entry see Field 8A.
-02548

EFFECTS OF CURRENTS AND WAVES N OIL SLICK RETAINED BY A BARRIER,
s A and M Research Foundation, College Sta-

primary bibliographic entry see Field 5G.
-02549

EZEUP PROCESSES ON ARCTIC CHES,
siana State Univ., Baton Rouge. Coastal Stu-nst.
rimary bibliographic entry see Field 2C.
02551

GE SYSTEMS APPROACH TO WATER LITY MODELLING AND MANAGEMENT,
Univ. at Austin.
rimary bibliographic entry see Field 5B.
02564

RIBUTED PARAMETER SYSTEMS AP-XIMATION FOR ESTUARINE WATER LITY MODELLING AND CONTROL,
Univ. at Austin.
rimary bibliographic entry see Field 5B.
02565

SOME INSTITUTIONAL CONSTRAINTS TO COASTAL ZONE MANAGEMENT: A CASE STUDY OF HAWAII,
Hawaii Univ., Honolulu. Coll. of Tropical Agriculture.
For primary bibliographic entry see Field 6E.
W76-02624

THE DELAWARE ESTUARY SYSTEM, ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC EFFECTS: ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W76-02626

REVIEW OF MODELS OF TIDAL WATERS,
Monash Univ., Clayton (Australia), Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W76-02689

ANNUAL AND LONGER TERM VARIATIONS OF DEEPWATER PROPERTIES IN THE COASTAL WATERS OF SOUTHERN BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
G. L. Pickard.
Journal Fisheries Research Board of Canada, Vol 32, No 9, p 1561-1587, September 1975. 17 fig, 6 tab, 16 ref.

Descriptors: *Inlets(Waterways), *Bathymetry, *Estuarine environment, *Temporal distribution, Estuaries, Temperature, Salinity, Density, Dissolved oxygen, Depth, Time series analysis, Data collections, Analysis, Deep water, Variability, Oceanography, On-site investigations.
Identifiers: *British Columbia(Canada), Annual variation.

Observations of deepwater properties (temperature, salinity, dissolved oxygen, and the derived values of density) were assembled from the Data Reports of the Institute of Oceanography of the University of British Columbia, and values of the first three properties were presented to show the characteristics of their annual variations at 18 locations in the coastal waters of southern British Columbia. Information on the long-term variations (for 6 yr or more) of all properties was presented for eight of the locations. Variations of 1-yr period were evident to 100 m depth at all locations and to 300 m or more at many of them. The variations were of different forms, sinusoidal, peaked or saw-tooth, and there were some differences in phase between the property variations at different locations. Long-term variations (over several years) of annual mean values were small and decreased with increase of depth. Much of the evidence suggested that the changes below 100 m depth were due to longitudinal advection (flow) from elsewhere rather than to vertical transfers from the sea surface in the immediate locality. (Adams-ISWS)
W76-02693

STRATIFIED LAKE AND OCEANIC BRINES: SALT MOVEMENT AND TIME LIMITS OF EXISTENCE,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W76-02696

PARTICLE SIZE DISTRIBUTIONS IN A REGION OF COASTAL UPWELLING ANALYZED BY CHARACTERISTIC VECTORS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W76-02697

RESULTS OF SEA SURFACE MAPPING IN THE PERU UPWELLING SYSTEM,
San Francisco State Univ., Calif. School of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-02698

(OPTIMAL DESIGN FOR WAVE SPECTRUM ESTIMATES,
Delaware Univ., Newark.
M. A. Tayfun, C. Y. Yang, and G. C. Hsiao.
Journal of Geophysical Research, Vol 80, No 15, p 1937-1947, May 20, 1975. 5 fig, 2 tab, 25 ref, 3 append. ONR N00014-69-40407.

Descriptors: *Waves(Water), *Ocean waves, *Model studies, Mathematical models, Computer models, Estimating, Analytical techniques, Beaches, Coasts, Lakes, Oceans, Estuaries.
Identifiers: *Wave spectra, Storm-generated waves.

The applicability of the existing estimating methods is restricted to the stationarity conditions in a wave field. For nonstationary conditions a generalization of the conventational definition of spectrum as a distribution in both time and frequency suggests a filtering technique for spectral estimations. The statistical estimation erros associated with the general form of estimates were concisely described in a relative mean square error criterion. A minimization of this error as an overall figure of merit for the accuracy of estimates yielded an optimal procedure for constructing an estimate that can be regarded as the most accurate one for the given physical wave data. Concepts were illustrated with actual wave data analysis, and the validity of the optimal procedure was demonstrated by simulation and comparison with the results from conventional techniques. (Sims-ISWS)
W76-02705

POSSIBLE BOTTOM CURRENT RESPONSE TO SURFACE WINDS IN THE HUDSON SHELF CHANNEL,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
L. W. Lavelle, G. H. Keller, and T. L. Clarke.
Journal of Geophysical Research, Vol 80, No 15, p 1953-1956, May 20, 1975. 4 fig, 9 ref.

Descriptors: *Currents(Water), *Winds, *Continental shelf, Estuaries, Coasts, Ocean currents, Water circulation, Oceanography, Measurement, On-site investigations, Data processing, New York.
Identifiers: *Hudson Shelf Channel, *New York Bight.

Current measurements made in the Hudson Shelf Channel during the summer of 1973 showed essentially channel axial bottom current even though the channel aspect ratio is small in the area of measurement. Although the current record is of short duration, correlation of water movement with surface winds was suggested by the data. The sense of summertime nontidal bottom flow in the channel (up or down channel) would appear to be controlled by the surface wind direction (offshore or onshore). These results would suggest the likelihood of net down-channel flow during the summer months. (Sims-ISWS)
W76-02706

A MODEL OF SIMPLE RAFTING IN SEA ICE,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
For primary bibliographic entry see Field 2C.
W76-02708

HORIZONTAL SCALES OF MIDOCEAN INTERNAL TIDES,
Scripps Institution of Oceanography, La Jolla, Calif.
T. P. Barnett, and R. L. Bernstein.
Journal of Geophysical Research, Vol 80, No 15, p 1962-1964, May 20, 1975. 4 fig, 1 tab, 14 ref. ONR N00014-69-A-0200-6043.

Descriptors: *Oceans, *Tides, *Pacific Ocean, Temperature, Measurement, Buoys, On-site investigations, On-site data collections, Oceanography, Data processing, Analytical techniques.
Identifiers: *Midocean internal tides, Semidiurnal tides, Temperature spectra.

The space scales associated with the semidiurnal internal tides in the central Pacific were investigated by using time series of temperature obtained from moored buoy arrays. Excellent phase coherence was found in the vertical from near the surface to depths exceeding 150 m. Phase coherence existed horizontally over distances of at least 5 but less than 50 km. With one exception the thermobaric energy associated with the semidiurnal tide showed no coherence in either the vertical (0-150 m) or the horizontal (5-500 km). (Sims-ISWS)
W76-02709

MEASUREMENT OF INTERNAL WAVES OF TIDAL FREQUENCY NEAR A CONTINENTAL BOUNDARY,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environment Lab.
W. B. Barbee, J. G. Dworski, J. D. Irish, L. H. Larsen, and M. Rattray, Jr.
Journal of Geophysical Research, Vol 80, No 15, p 1965-1974, May 20, 1975. 7 fig, 8 tab, 22 ref. ONR NOR 014-67-A-0103-0014, NSF GA 30745X.

Descriptors: *Internal waves, *Continental shelf, *Pacific Ocean, Temperature, Salinity, Coasts, Tides, On-site investigations, On-site data collections, Data processing, Analytical techniques, Oceanography, Measurement.
Identifiers: *Vancouver Island(Canada), Temperature spectra.

The internal wave field seaward of the continental shelf break off Vancouver Island, British Columbia, was measured with an array of four moored temperature sensors and numerous salinity-temperature depth casts. These measurements have been analyzed for their energy content at the semidiurnal tidal frequency, and the results compared with a theory of generation of internal tides at a shelf break. A peak in amplitude was observed at a depth slightly greater than that predicted by the theory. The observed phase change across this peak is consistent with seaward propagation of energy from the shelf break. (Sims-ISWS)
W76-02710

VERTICAL ENERGY PROPAGATION OF INERTIAL WAVES: A VECTOR SPECTRAL ANALYSIS OF VELOCITY PROFILES,
Woods Hole Oceanographic Institution, Mass.
K. D. Leaman, and T. B. Sanford.
Journal of Geophysical Research, Vol 80, No 15, p 1975-1978, May 20, 1975. 5 fig, 1 tab, 3 ref.

Descriptors: *Waves(Water), *Ocean waves, *Atlantic Ocean, Velocity, On-site data collections, Data processing, Analytical techniques, Oceanography.
Identifiers: *Velocity profiles, Inertial waves, Brunt-Vaisala frequency, Vector spectral analysis.

Vertical propagation of near-inertial period waves has been detected in a series of recent velocity profiles by a technique of vector spectral analysis. This method, previously applied to vector series in time, has been used to study the vertical spatial structure of velocity profiles obtained in the Mid-Ocean Dynamics Experiment (MODE). Prior to the use of spectral analysis, however, it is necessary to minimize the influence of vertical variations of the Brunt-Vaisala frequency. The procedure was to normalize the current amplitudes and stretch the vertical coordinate according to a WKB scheme. The vector spectral analysis, applied to the normalized and stretched profiles, yielded wave polarization estimates which are related to the sign of the vertical group velocity of internal waves. The analysis of a set of velocity profiles indicated that the net energy flux of the waves near the inertial frequency is downward. (Sims-ISWS)
W76-02711

SIGNIFICANCE OF VITAMINE B12 IN MARINE BIOCENOSES, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 5A.
W76-02719

PRINCIPAL TENDENCIES IN THE BIOLOGY OF THE MODERN BALTIC SEA, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
For primary bibliographic entry see Field 5C.
W76-02770

ACCUMULATION OF THE IRON GROUP ELEMENTS BY PHYTOPLANKTON, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
For primary bibliographic entry see Field 5B.
W76-02772

SOME ECOLOGIC CONSIDERATIONS ON THE FLORA AND FAUNA OF THE SOUTHERN PART OF THE MUSURA BAY (THE DELTA OF THE DANUBE INTO THE BLACK SEA), (IN FRENCH),
D. Manoleli, L. Gruia, and T. Nalbant.
Trav Mus Hist Nat 'Grigore Antipa', 15: 149-172, Illus. 1974. (Engl., Rom., and Russ. summary).

Descriptors: *Benthic fauna, *Algae, *Distribution patterns, Bays, Ecology, Deltas.
Identifiers: *Black Sea, *Danube delta, *Romania(Musura Bay).

The pattern of distribution of benthic algae and fauna in the southern part of Musura Bay is discussed. The physical and chemical conditions in this part of the bay are also given.--Copyright 1975, Biological Abstracts, Inc.
W76-02909

BAROCLINIC INSTABILITY OVER A SLOPE. PART I: LINEAR THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
J. E. Hart.
Journal of Physical Oceanography, Vol 5, No 4, p 625-633, October 1975. 5 fig, 3 tab, 7 ref, 1 append.

Descriptors: *Theoretical analysis, *Froude number, *Ocean circulation, *Ocean currents, Fluid mechanics, Equations, Pressure, Currents(Water), Slopes, Oceanography, Model studies.
Identifiers: *Instability, Linear theory, Two-layer ocean, Baroclinic flow, Rossby number, Sloping seabed, Gyres.

The instability properties of a circular current in the upper layer of a two-layer quasi-geostrophic ocean over a unidirectional bottom slope were investigated. This flow and topography geometry was intended as a crude model of geostrophic gyres where the variation of the Coriolis force is negligible. Such currents occur in the Arctic and in Gulf Stream rings. The slope destablizes the flow the critical Froude number is lowered as the slop was increased. Baroclinic instabilities tend t generate time-independent or mean currents in th upper and lower layers which, because of th slope, are markedly asymmetric across the gyre (See also W76-02918) (Adams-ISWS)
W76-02917

BAROCLINIC INSTABILITY OVER A SLOPE PART II: FINITE-AMPLITUDE THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. o Meteorology.
J. E. Hart.
Journal of Physical Oceanography, Vol 5, No 4, p 634-641, October 1975. 3 fig, 1 tab, 7 ref, 1 append

Descriptors: *Theorectical analysis, *Froud number, *Ocean circulation, *Ocean currents Fluid mechanics, Equations, Pressure, Cur rents(Water), Slopes, Flow, Waves(Water).
Identifiers: *Instability, Finite-amplitude theory Two-layer ocean, Baroclinic flow, Rossb number, Sloping seabed, Gyres.

Baroclinic instability of a circular current has bee found to be modified by the presence of unidirectional bottom slope. Atheory wa developed for the slightly unstable flow regim over a weak slope. The slope created azimutha sidebands to the basic azimuthal wavenumber o the instability. Interaction of the sidebands wit the slope caused a decrease in the stability of the flow compared with the case with a flat bottom Interation of the sidebands with the primary baroclinic wave produced a time-independent asymmetric current. The basic wave self-interaction produced a time-independent current which flowed up the slope and generated asymmetric vorticity. This effect was predominant when the Rossby radius of deformation was much smaller than the radius of the basic current. (See also W76-02917) (Adams-ISWS
W76-02918

GEOMORPHIC PROCESSES ACTIVE IN THE SOUTHWESTERN LOUISIANA CANAL, LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 2J.
W76-02930

COMPARATIVE STUDY OF FRESH-SALT WATER INTERFACES USING FINITE ELEMENT AND SIMPLE APPROACHES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
A-A. I. Kashef, and M. M. Safar.
Water Resources Bulletin, Vol 11, No 4, p 651-665, August 1975. 3 fig, 4 tab, 15 ref, 1 append. OWRT C-4061 (No 9013) (3).

Descriptors: *Saline water intrusion, *Artesian aquifers, *Groundwater movement, *Finite element analysis, *Water resources, Earth dams, Analytical techniques, Methodology, Interfaces, LaPlaces equation, Saline water-freshwater interfaces, Aquifers, Dams, Groundwater, Coasts.
Identifiers: *Dupuit's equation, Hydraulic forces method.

The fresh-salt water interface in artesian aquifers has been investigated by various techniques on the basis of its analogy to the free surface in earth dams or cores of dams. Some more or less exact solutions exist with various approximations. A simple method was developed by analyzing hydraulic forces. A finite element method was suggested and the results compared with the method of hydraulic forces. The presented procedure eliminates some of the difficulties and uncertainties in current finite element procedures. When management problems are studied, the complex existing conditions under natural flow can be

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etermined simply by Dupuit's equation when the ngth of intruded zone or base width of an earth ctangular section exceeds the thickness of the tesin artesian aquifer. (Singh-ISWS)
76-02940

IVESTIGATION OF MATHEMATICAL ODELS FOR THE PHYSICAL FATE PREDIC-ION OF DREDGED MATERIAL,
rmy Engineer Waterwasys Experiment Station, cksburg, Miss. Office of Dredged Material esearch.
r primary bibliographic entry see Field 5B.
76-02946

ODELS AND THE DECISION MAKING ROCESS: THE HUDSON RIVER POWER ANT CASE,
ookhaven National Lab., Upton, N.Y. Dept. of ology.
r primary bibliographic entry see Field 6G.
76-02987

WATER SUPPLY AUGMENTATION AND CONSERVATION

A. Saline Water Conversion

EMBRANE EVAPORATOR/SUBLIMATOR VESTIGATION,
Research Mfg. Co., Los Angeles, Calif.
Elam, J. Ruder, and H. Strumpf.
ailable from the National Technical Informa-n Service, Springfield Va 22161 as N74 33588, 00 in paper copy, $2.25 in microfiche. Report 74-10256, April 2, 1974. 38 p, 18 fig, 6 tab, 10 NASA NAS9-10465.

scriptors: *Membranes, *Semipermeable mem-nes, *Cooling, Water cooling, Air conditioning, aporation, Sublimation, Evaporators, Equip-nt, Laboratory tests, Engineering, Membrane cesses, Separation techniques, Desalination.
ntifiers: *Life support systems, Membrane porators, Membrane sublimators, Hollow fiber nbranes.

purpose of the membrane evapora-sublimator program was to develop data on a evaporator/sublimator concept using a hollow r membrane unit with a high permeability to id water. The aim of the program was to obtain ore reliable, lightweight, and simpler Extra icular Life Support System (EVLSS) cooling cept than is currently being used. The program sisted of evaluating possible materials to be ed as an evaporator/sublimator, running tests arious units in a vacuum chamber to test out feasibility of the concept, and then analyzing results of the program to obtain a design in-ated with a recirculating thermal control water . Two available membrane units were tested in cuum chamber. In one unit the hollow fiber rial was cellulose acetate, and in the other the material was cellulose. Both units ved a cooling rate in excess pf 12,000 Btu per (the test units weighed about one pound net). cellulose acetate unit operatedsuccessfully as an evaporator; it forze when operated as a mator. The cellulose unit operated sucessfully th the evaporation/sublimation regimes. The was highly successful and proved out the con-of cooling by permeation through semi-eable membranes. The specific cooling city of the unit (BTU/lb of unit) was several greater than that obtained with present con-ations. (Sims-ISWS)
02538

IBRANE HUMIDITY CONTROL IN-TIGATION,
search Mfg. Co., Los Angeles, Calif.
J. Elam, J. Ruder, and H. Strumpf.
Available from the National Technical Information Service, Springfield, Va 22161 as N74 33590, $4.00 in paper copy, $2.25 in microfiche. Report No 74-10255, April 15, 1975. 26 p, 7 fig, 6 tab, 14 ref. NASA NAS9-10465.

Descriptors: *Membranes, *Semipermeable membranes, *Drying, Water vapor, Air, Separation techniques, Laboratory tests, Membrane processes, Equipment, Evaluation, Engineering, Desalination.
Identifiers: *Life support systems, *Membranes dehumidifers, Hollow fiber membranes.

The purpose of the membrane humidity control program was to obtain basic performance data on a hollow fiber membrane unit that removes water vapor from a breathing gas loop by diffusion. With this approach no coolant or vapor condensation is required and very low outlet dew points are possible. A hollow fiber membrane unit made of cellulose acetate was tested to determine the permeability to gas and water vapor. Using the data obtained, an analysis was performed to determine a configuration and preliminary design for a flight unit. Several possible available hollow fiber materials were evaluated for use as a dehumidifier. The most promising materials found were cellulose and cellulose acetate. These materials have extremely high permeability constants for water vapor and, thus, would result in relatively small units. With the available laboratory unit, the maximum flow rate that could be obtained was approximately 2.5 lb/hr. At this low rate, extreme difficulty was experienced withthe test setup in obtaining a constant humidity level in the inlet gas stream, especially at dew points above ambient. The test setup required the use of heated insulated lines and infra-red lamps to prevent condensation. (Sims-ISWS)
W76-02539

AN ADVANCED SEEDING PROCESS IN SALINE WATER CONVERSION,
Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany). Institut fuer Werkstoff-technologie.
K. R. Frohner, and H. Panahandeh.
Available from the National Technical Information Service, Springfield Va 22161 as GKSS 74E 40, $3.50 in paper copy, $2.25 in microfiche. Report GKSS 74/E/40, Paper presented at the GVC-AIChE-Joint Meeting, Munich, September 17-20, 1974. 19 p, 5 fig, 1 tab, 14 ref.

Descriptors: *Desalination, *Desalination processes, *Flash distillation, *Scaling, Calcium sulfate, Descaling, Treatment, Water treatment, Sea water, Saline water, Water purification, Separation techniques, Demineralization.
Identifiers: *Barium sulfate.

The maximum process temperature in thermal saline water conversion plants, e.g., multi-stage flash evaporators, is at present limited by the production of calcium sulfate scale on heat transfer surfaces. The so-called seeding process, using calcium carbonate or sulfate as a seed, is effective in limiting calcium scale formation but suffers from several disadvantages. They can probably be overcome by the use of barium sulfate as a seed. Finely powdered barite has shown its effectivity as a seed in several pilot plant experiments. Based on these results, a technical feasibility study has been elaborated. It is presented as a multi-stage flash evaporator plant working according to the barium sulfate seeding process (BSS). This process comprises recycling of the barium sulfate seed and, in addition, inherent diminution of the Ca concentration in the circulated brine. (Sims-ISWS)
W76-02540

MEMBRANE WATER DEAERATOR IN-VESTIGATION,
AiResearch Mfg. Co., Los Angeles, Calif.
For primary bibliographic entry see Field 5F.
W76-02541

APPARATUS FOR THE TREATMENT OF WATER SOLUTIONS BY ION EXCHANGE,
Hager and Elsaesser, Stuttgart-Vaihingen (West Germany). (Assignee).
For primary bibliographic entry see Field 5D.
W76-02609

CHARGE-MOSAIC MEMBRANES,
Harvard Medical School, Boston, Mass. Biophysical Lab.
J. N. Weinstein, and S. R. Caplan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-236 615 price of $10.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report INT-OSW-RDPR-74-987, July 1974, 298 p; 72 fig, 27 tab, 211 ref, 1 append. OWRT Contracts 14-01-0001-977, 14-01-0001-2148 and 14-30-3145.

Descriptors: *Desalination, *Membrane processes, *Membranes, *Dialysis, *Electro-osmosis, Separation techniques, Waste water treatment.
Identifiers: *Piezodialysis, *Mosaic membranes, *Charge-mosaic membranes, Composite membranes, Salt flux.

A charge-mosaic membrane consists of a set of anion and cation exchange elements arranged in parallel, each element providing a continuous pathway from one bathing solution to the other. If a gradient of electrolyte concentration is established across the membrane, anions and cations can flow in parallel through their respective pathways without a violation of macroscopic electroneutrality. In electrical terms, these flows appear as a circulation of current which short-circuits the concentration potentials across the individual ion exchange elements. As a result, the charge-mosaic typically shows a salt permeability orders of magnitude greater than the intrinsic salt permeabilities of its constituent parts. If pressure is applied on one side of the charge-mosaic, the resulting streaming potentials are likewise short-circuited by circulation of current, and the solution emerging on the low pressure side is likely to be more concentrated than that on the high pressure side. This notion underlies 'piezodialysis', a novel and possibly important technique for desalination of sea water. The charge-mosaic can also be used to achieve new ranges of separations in dialysis, hemodialysis, equilibrium dialysis, and a potentially-portable artificial kidney. The analytical tools used in this work are most immediately applicable to macroscopic systems, which category may or may not include biological membranes, depending on the precise question at issue. Common biological models which look and function like mosaics include the 'parallel pumps,' 'pump leaks,' and 'parallel-leaks,' as well as the whole host of equivalent circuits. (OWRT)
W76-02734

APPLICATIONS OF DIRECT OSMOSIS: DESIGN CHARACTERISTICS FOR HYDRATION AND DEHYDRATION,
Arizona Univ., Tucson. Dept. of Physics.
For primary bibliographic entry see Field 5D.
W76-02745

MULTIPLE RE-USE OF WATER,
For primary bibliographic entry see Field 5D.
W76-02816

3B. Water Yield Improvement

CARBON BLACK INCREASES SNOWMELT AND FORAGE AVAILABILITY ON DEER WINTER RANGE IN COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
W. L. Regelin, and O. C. Wallmo.
U.S. Department of Agriculture, Forest Service, Research Note RM-296, 4 p, September,, 1975. 11 ref.

Descriptors: *Snowmelt, *Forages, *Rocky Mountain Region, *Carbon, Snow management, Deer, Air temperature, Mountains, Slopes, Melting, Wildlife, Activated carbon, Winter, Seasonal, Colorado.
Identifiers: *Carbon black.

Carbon black offers a potential method of increasing the availabily of deer forage on winter ranges in Colorado. On slopes with a southern exposure, over 40 cm of snow was melted to bare ground in February when air temperatures averaged -8.8C during daylight hours. Addition of the carbon black did not alter snow density. (Witt-IPC)
W76-02518

EFFECTS OF RAINFALL AND TEMPERATURE ON THE DISTRIBUTION AND BEHAVIOR OF LARREA TRIDENTATA (CREOSOTE-BUSH) IN THE MOJAVE DESERT OF NEVADA,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 2I.
W76-02524

THE ICE NUCLEATING PROPERTIES OF AN ULTRAFINE AEROSOL OF PURE SILVER IODIDE,
Paris-6 Univ. (France). Laboratoire de Meteorologie.
For primary bibliographic entry see Field 2B.
W76-02554

SILVER IODIDE AEROSOL PRODUCTION BY A PLATED HOT-WIRE GENERATOR,
Wisconsin Univ., Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W76-02555

VEGETATION RESPONSES TO GRAZING, RAINFALL, SITE CONDITION, AND MESQUITE CONTROL ON SEMIDESERT RANGE,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2I.
W76-02663

ECOLOGICAL RAMIFICATIONS OF SILVER IODIDE NUCLEATING AGENT ACCUMULATION IN A SEMI-ARID GRASSLANDS ENVIRONMENT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
D. A. Klein, and E. M. Molise.
Journal of Applied Meteorology, Vol 14, No 5, p 673-680, August, 1975. 3 fig, 6 tab, 31 ref.

Descriptors: *Weather modification, *Chemical precipitation, *Silver iodide, *Environmental effects, *Grasslands, Arid lands, Soil microorganisms, Bacteria, Carbon dioxide, Root zone, Grasses, Ecology, Soils, Nitrates, Cloud seeding.
Identifiers: Silver nitrate, Mineralization.

Possible ecological effect of silver iodide accumulation which might result from weather modification programs are examined. After three growing seasons, silver iodide presence above levels expected from weather modification appears related to decreased soil oxygen uptake, carbon dioxide evolution, and bacterial glucose mineralization activities. The threshold for possible observation of decreased mineralization is in the range of 1-2 micrograms g(-1) silver. A significant increase in silver-reducing microorganisms was noted only in the high-level silver nitrate treated soils. Analysis of silver distribution suggests concentration in the plant root zone, with lesser levels in grasses from silver iodide than from silver nitrate. Silver levels which might accumulate in soils appear to be at least 1-2 magnitudes below those where first silver iodide effects on decomposer functions might be seen. A model is presented. It is suggested that monitoring of treatment plots and seeding generator silver gradients should be continued in order to extend the time scale over which the ecological effects can be predicted. (Mills-Arizona)
W76-02665

BENEFICIAL AND DETRIMENTAL EFFECTS OF RANGE IMPROVEMENT PRACTICES ON RUNOFF AND EROSION,
Utah State Univ., Logan. Coll. of Natural Resources; and Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4C.
W76-02671

THE HISTORICAL POTENTIAL OF SNOWFALL AS A WATER RESOURCE IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
B. M. Tunnicliff.
Master of Science Thesis, 1975, 137 p, 35 fig, 7 tab, 12 ref, 3 append.

Descriptors: *Snowfall, *Snowmelt, *Water supply, *Arizona, *Climatology, *Dendrochronology, Meteorology, Precipitation(Atmospheric), Hydrologic cycle, Snow surveys, Arid lands, Water resources development, Planning, Water utilization, Water resources, Potential water supply, Water requirements, Trees, Probability, Statistical methods.
Identifiers: San Francisco Mountains(Ariz), White Mountains(Ariz).

The state of Arizona, situated in an arid region, is using nearly all of its available ground and surface water resources to meet its domestic, industrial, and agricultural needs. In order to aid in the determination of snowmelt water resources, tree-ring chronologies from the San Francisco Mountains and White Mountains region of central Arizona were used to reconstruct past annual snowfall water equivalents for up to the last 500 years. Using these reconstructions, long-term means and variances of annual snowfall were calculated and short and long-term trends of snowfall were identified. Response functions were developed for the tree-ring chronologies to isolate those which were responding to snowfall. Chronologies responding to snowfall were calibrated with modern snowfall records and snowfall reconstructions were generated for the length of the chronologies with the calibration equations. most notable of long-term snowfall trends is the somewhat atypically stable mean snowfall water supply central Arizona has experienced since the 1920's. Periods of far less mean snowfall have occurred before then. in terms of surface water resources from snowmelt, central Arizona can expect periods of greater long-term snowfall variability than it has come to depend on in the last 40 years. (Robinett-Arizona)
W76-02675

CONTROLLED GENERATION OF LARGE VOLUMES OF ATMOSPHERIC CLOUDS IN A GROUND-BASED ENVIRONMENTAL CHAMBER,
National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center.
For primary bibliographic entry see Field 2B.
W76-02686

MULTIPLE USE EFFECTS OF MANIPULATING PINYON-JUNIPER,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah. p 469-477, 5 fig, 2 tab, 5 ref.

Descriptors: *Pinyon pine trees, *Juniper trees, *Forest management, *Vegetation establishment, *Water yield improvement, Pine trees, Trees, Vegetation effects, Vegetation regrowth, Clear cutting, Herbicides, Cutting management, Canopy, Plant growth regulators, Water yield, Wildlife, Forages, Carrying capacity, Cost-benefit ratio, Planning, *Arizona.
Identifiers: Pinyon-Juniper stands, Overstory removal, Cabling, Beaver Creek watershed(Ariz).

Three different techniques of overstory removal--cabling, herbicide, and felling--were used in order to determine water yield improvement on the Beaver Creek watershed in the Coconino National Forest of Arizona. Results indicate that water yield is not improved by mechanical methods of pinyon-juniper removal but can be improved by herbicide removal of moderately dense to dense pinyon-juniper stands. Herbage yields increase after virtually all pinyon-juniper treatments, but due to differences in plant composition, potential livestock carrying capacity varies greatly. On the average the response by deer to these treatments is neutral. Projects which are successful in converting from a pinyon-juniper stand to a good stand of forage plants just about break even from a benefit-cost standpoint under 1972 conditions assumming no wood product sales are included. The author concludes that considerable planning and forethought should precede further pinyon-juniper conversion attempts as we must have a better understanding of how these different areas respond to different treatment techniques in terms of water yield, forage production, wood production, wildlife habitat, and in recreational and esthetic aspects. (Robinette-Arizona)
W76-02723

VARIABILITY OF INFILTRATION CHARACTERISTICS AND WATER YIELD OF A SEMI ARID CATCHMENT,
Arizona Univ. Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2G.
W76-02742

FREEZE-THAW EFFECTS ON SOILS TREATED FOR WATER REPELLENCY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2C.
W76-02743

DESCRIBING SNOWPACKS IN ARIZONA MIXED CONIFER FORESTS WITH A STORAGE-DURATION INDEX,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2C.
W76-02744

SNOWMELT RUNOFF EFFICIENCIES ON ARIZONA WATERSHEDS,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
For primary bibliographic entry see Field 2C.
W76-02866

CHARACTERIZATION OF SNOWMELT RUNOFF EFFICIENCIES,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.

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r primary bibliographic entry see Field 2C.
76-02871

FECT OF AN ASPHALT BARRIER ON ATER STORAGE AND DROUGHT PROBA-LITY,
nnesota Univ., St. Paul, Dept. of Soil Science.
P. Palta, and G. R. Blake.
ronomy Journal, Vol 66, No 2, p 209-212, rch-April, 1974. 3 fig, 2 tab, 7 ref. OWRT B-5-MINN(9).

scriptors: *Water storage, Probability, sphalt, *Barriers, *Droughts, Drought re-tance, Available water, Soil water, *Soil water vement, Moisture availability, Moisture stress, ter yield improvement.

ld measurements of water redistribution after ltration were made on two sandy soils with and hout asphalt barriers at a 55 cm depth to deter-ne the barrier effect on soil water potential dients and on water retention at various times. imates of the effect of the barrier on seasonal ught severity and on movement of water to izons below the barrier were made on one of soils. Soil water potential gradients and the metric water content at different depths were rly the same for barrier and nonbarrier plots on bbard loamy coarse sand because a coarse d-gravel layer between the 25 and 50-cm soil ths acts as a water barrier. After 96 hours nage, suctions in Zimmerman fine sand ched 31 cm of water just above the barrier and m at the same depth without barrier. Available er to barrier depth was increased from 2.9 cm 7.5 cm by the barrier. (Skogerboe-Colorado e)
5-02872

. Use Of Water Of Impaired Quality

FORMANCE OF AUXILIARY BACTERI-ES IN PROCESS WATERS (PRESTAZIONE LI AUSILIARI BATTERICIDI NELLE UE DI FABBRICAZIONE),
tro di Sperimentazione Cartotecnica, Milan y).
irpi.
stria della Carta, Vol 13, No 6, p 247-249, , 1975. 5 ref. 2 tab.

criptors: *Slime, *Bactericides, *Pulp and r industry, Organic compounds, Sulfur com-ds, Phenols, Halogens, Inhibitors, Water ty control.
ifiers: Paper mills.

review discusses the properties of various bicides (chloro- and bromophenols, organic r compounds, and organometallic com-ds) in controlling slime formation in paper Included is a brief report of studies on the n of a series of such antislime agents in the lation system of a laboratory-scale paper ine. (Speckhard-IPC)
02504

MICAL RUN-OFF IN CATCHMENTS CON-TED TO AGRICULTURAL USE,
rtment of Scientific and Industrial Research, r Hutt (New Zealand). Ecology Div.
rimary bibliographic entry see Field 5B.
02528

URIC ACID FOR REDUCING SODIUM ARD OF IRRIGATION WATER,
na Univ., Tucson. Dept. of Soils, Water and eering.
Gumaa.
r of Science Thesis, 1975, 36 p, 4 fig, 7 tab, 5 append.

Descriptors: *Irrigation water, *Water quality, *Saline water, *Sodium, *Acids, *Carbonates, Salinity, Salts, Sodium compounds, Acid-base equilibrium, Alkalinity, Hydrogen ion concentration, Neutralization, Water properties, Irrigation practices, Soil physical properties, Agriculture, Water management(Applied), Hydraulic conductivity, Infiltration, Hardness(Water), Adsorption.
Identifiers: *Sulfuric acid, Sodium adsorption ratio, Exchangeable sodium percentage.

Irrigation waters having a high sodium adsorption ratio cause adverse effects on soil physical properties as well as on plant growth. In this paper the effect of sulfuric acid added to irrigation water on the sodium adsorption ratio, exchangeable sodium percentage, and saturated hydraulic conductivity was studied. The experimentation used 5 soil samples and 5 different waters simulating those used for irrigation in the Southwestern U.S. The addition of sulfuric acid to the irrigation water decreased the sodium adsorption ratio and the exchangeable sodium percentage. From the results presented, the author concludes that conventional equations based on the pH sub c parameter overestimated the effect of bicarbonates on the sodium adsorption ratio, while the equation based on carbonate equilibrium gave a more realistic estimate. The measured exchangeable sodium percentage was proportional to the calculated sodium adsorption ratio. Acid application to irrigation waters (acid was applied in amounts sufficient to prevent Ca precipitation but with the pH remaining above 7 to prevent corrosion) may increase the rate of water movement when the sodium adsorption ratio is as low as 7.0 in some soils without lowering the pH to acid conditions. (Robinett-Arizona)
W76-02666

PHOSPHORUS SORPTION AND DESORPTION IN CALCAREOUS SOILS FROM ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W76-02677

WATER RESOURCES MANAGEMENT FOR PART OF THE LOWER GILA VALLEY,
Arizona Univ., Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 3F.
W76-02678

MANAGEMENT FOR THE CONTROL OF SALTS IN IRRIGATED SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. H. Fuller, and A. D. Halderman.
University of Arizona, College of Agriculture Bulletin A-43, 1975. 11 p, 8 fig, 2 append.

Descriptors: *Salts, *Saline soils, *Water quality, *Irrigation water, *Soil management, *Arid lands, Land reclamation, Alkaline soils, Salinity, Soil chemical properties, Salt tolerance, Farm management, Irrigation practices, Leaching, Soil-water-plant relationships, Soil physical properties, Agriculture, Root zone, Water management(Applied), Timing, Cultivation, Planting management, Rotations.

Permanent agriculture in arid and semiarid lands depends upon the control of salt in soils. Irrigation water and soil materials are the main sources of salts that may accumulate or concentrate in undesirable amounts within the root zone. This report is concerned primarily with basic principles and practices of water, soil, and crop management in irrigated lands to prevent harmful levels of salt accumulation, in addition to presenting concepts of management related to long-time irrigation and leaching of soils. Water management practices discussed include methods of irrigation and timing of irrigation for salt control, quality and quantity of water used for leaching, and salt movement in relation to water movement. Soil management practices discussed include tillage for improved infiltration, organic matter and crop residues, and crop-land selection. Cultural management practices are also discussed in relation to relative salt tolerances plants, seed placement, and crop selection and rotation. (Robinett-Arizona)
W76-02679

COMPOSITION AND CONCENTRATION OF SALTS IN SOIL SOLUTIONS OF THE MURGAB OASIS DESERT-MEADOW SOILS UNDER ANCIENT IRRIGATION, (IN RUSSIAN),
G. V. Vinogradova.
Probl Osvoeniya Pustyn'. 6: 38-44. 1975.

Descriptors: *Soils, *Deserts, Irrigation, Sulfates, *Sodium sulfate, *Saline soils, *Salinity, Chlorides, *Calcium carbonate, *Sodium chloride.
Identifiers: Murgab Desert, Magnesium sulfates, *USSR.

Calcium carbonates and sulfates are the principal components of salts of weakly concentrated soil solutions. High rates of sodium and magnesium sulfates are characteristic for moderately and highly concentrated solutions. The content of sodium chloride for all the concentrations of the solutions is from minimum (2.1 g/l) to maximum (97.9 g/l).--Copyright 1975, Biological Abstracts, Inc.
W76-02732

ECONOMIC ADJUSTMENT TO A NEW IRRIGATION WATER SOURCE: PINAL COUNTY, ARIZONA AND THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-02737

SALT BALANCE IN GROUNDWATER OF THE TULARE LAKE BASIN, CALIFORNIA,
For primary bibliographic entry see Field 4B.
W76-02751

SODIUM RELATIONS IN DESERT PLANTS: 4. SOME PHYSIOLOGICAL RESPONSES OF ATRIPLEX CONFERTIFOLIA TO DIFFERENT LEVELS OF SODIUM CHLORIDE,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
G. E. Kleinkopf, A. Wallace, and J. W. Cha.
Soil Sciences, Vol 120, No. 1, p 45-48, July, 1975. 1 fig, 3 tab, 22 ref.

Descriptors: *Plant physiology, *Desert plants, *Saline soils, *Salt tolerance, *Plant morphology, Plant growth, Plant tissues, Leaves, Sodium chloride, Arid lands, Semiarid climates, Alkaline soils, Salinity, Saline water, Salts, Chemical properties, Irrigation water, Crop production, Proteins, Transpiration, Water balance, Plant morphology, Nitrogen, Magnesium, Potassium, Phosphorus, Respiration, Water requirements, Water conservation.
Identifiers: Atriplex confertifolia(Torr Frem), Wats, Water use efficiency.

Atriplex species are characteristic of those facultative halophytes that are particularly adapted to arid and saline regions of the world. Because of their salt tolerance and high productivity, many of the Atriplex species could be used for plant establishment in saline areas or for increasing productivity in arid or semiarid regions. The purpose of this study was to determine some physiological and morphological changes of A. confertifolia to various salt levels in order to gain information on plant salt tolerance. Maximum yields were obtained with a 50 milliequivalent per liter NaCl treatment. Higher levels of salt produced large, succulent leaves showing nitrogen deficiency systems .Physiological effects of salt

noted were decreased chlorophyll, soluble protein and nitrate, and loss of nitrate reductase activity in addition to the reduction of the uptake of Mg, K, and P. Net carbon assimilation rates were reduced, presumably due to salt-induced increases in respiration. Leaf water potential was decreased greatly by salt level increase. At a leaf temperature of 20 C, transpiration levels were quite insensitive to salt levels, but at 30 C transpiration rates decreased with increasing salt indicating greater water use efficiency. (Robinett-Arizona)
W76-02968

3D. Conservation In Domestic and Municipal Use

METHOD AND APPARATUS FOR CONSERVING WATER,
For primary bibliographic entry see Field 5D.
W76-02607

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF,
URS Research Co., San Mato, Calif.
For primary bibliographic entry see Field 5D.
W76-02758

COMPUTING THE BIG PICTURE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, and J. W. Labadie.
Water and Wastes Engineering, Vol 12, No 5, p 37-39, May, 1975. 3 fig. OWRT C-4172(9028)(6).

Descriptors: *Automatic control, *Water supply, *Urban drainage, *Flood control, Cities, Sewers, Storms, Rainfall, Runoff, Water resources development.
Identifiers: Urban water systems, Waste water management.

The concept of a management information and control system (MICS) as applied to urban water facilities has been named a Metropolitan Water Intelligence System (MWIS). Urban water systems have three major functions: water supply, waste water management, and urban drainage and flood control. Automation of such systems, where feasible, may increase efficiency as well as solve water quality standards and economic and administrative problems. Levels of automation in the United States may be monitoring only, remote supervisory control, computer assisted operator control, or closed loop automatic control. Cities with various stages of automation are Santa Clara, California; Denver, Colorado; Atlanta, Georgia; Monroe County, New York; Seattle, Washington; and San Francisco, California. The effectiveness of any large-scale control approach depends upon: development of adequate models for predicting storm events in real time over an urban center; accurate rainfall-runoff and sewer transport models; reliable communication systems and data process; and effective feedback control whereby control may be updated as a storm changes, based on successive storm predition. Although very sophisticated hardware exists in electronics, computers, pneumatics, hydraulics, and measurement, control applications need to be improved to the level of their potential. (Kramer-FIRL)
W76-02874

ASCE URBAN WATER RESOURCES RESEARCH PROGRAM,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Program.
For primary bibliographic entry see Field 2A.
W76-02939

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-02961

3E. Conservation In Industry

AMMONIA AND HYDROGEN SULPHIDE RECOVERY.
For primary bibliographic entry see Field 5D.
W76-02580

REUSE SOUR WATER STRIPPER BOTTOMS,
Betz Lab., Inc., Trevose, Pa.
For primary bibliographic entry see Field 5D.
W76-02582

LIQUID WASTE INCINERATION BY BALFOUR/NITTETU SYSTEM SOLVES EFFLUENT PROBLEMS, CAN PAY FOR ITSELF OR EVEN TURN WASTE INTO PROFIT.
For primary bibliographic entry see Field 5E.
W76-02591

DEVELOPING A CORPORATE RESPONSE TO POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass. School of Business Administration.
For primary bibliographic entry see Field 5G.
W76-02613

ENERGY DEMAND AND ITS EFFECT ON THE ENVIRONMENT,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 6D.
W76-02621

REGIONAL RESPONSE THROUGH PORT DEVELOPMENT: AN ECONOMIC CASE STUDY ON THE MCCLELLAN-KERR ARKANSAS RIVER PROJECT,
Arkansas Univ., Fayetteville. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W76-02623

WASTE CONTROL FOR JOB PLATERS,
For primary bibliographic entry see Field 5D.
W76-02793

TRAILER-MOUNTED PILOT PLANTS FOR WATER CONSERVATION,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W76-02800

HOW ABITIBI INSULATION BOARD MILL ACHIEVES ZERO EFFLUENT DISCHARGE.
Pulp and Paper, Vol 49, No 10, p 96-99, September, 1975, 1 fig.

Descriptors: *Pulp and paper industry, *Discharge(Water), *Water conservation, *Water reuse, Water pollution sources, Wastes, Industrial wastes, Florida, Water pollution control, Water quality control, Operating costs, Costs, Recirculated water, Water utilization, Impaired water use, Industrial water, Effluents, Wood wastes, Recycling, Closed conduits.
Identifiers: *Board mills, *Zero discharge, Insulation board, White water, Pulpwood.

Abitibi Corporation has reactivated a 125 ton/day board mill located in Blountstown, Florida, which utilizes low-cost wood-waste products as the raw material. Pulping and stock refining systems designed specifically to accommodate the relatively dry raw material and to attain zero discharge are outlined. Water is added to the digesters at the start of each cooking cycle, and steam is added required. The water added comes mainly from blow-bin drain-tank. Also, boiler blowdown wa and some machine white water are added to digesters; no fresh water is used. Dilution wate the refiner area comes mainly from the clean wh tank which receives clarified effluent from one two surge ponds, and the machine lean wh water chest. Dry edge trim removed from board is repulped in a hydropulper and recycl Sawdust generated in cutting the final produc collected by a wet scrubber, the water overfl being sent to the hydrapulper. Dilution water the hydrapulper and influent to the water scrub comes from the machine lean white water ch Water removed at the thickener is recirculated the hydrapulper. Stock from the broke chest diluted with lean white water and mixed with refiner stock. Machine white water is again u for dilution of the stock passing to the stuff b Other features of the closed water system described. In general, the closed water system comprised of a series of semiclosed loops wit the system. Substantial operating cost reductio as well as compliance with water pollution st dards have been achieved with the system. (Syk IPC)
W76-02947

RECOVERY OF SOLVENTS FOR THE PAI AND ALLIED INDUSTRIES,
For primary bibliographic entry see Field 5D.
W76-02976

MODELS AND THE DECISION MAKI PROCESS: THE HUDSON RIVER POWE PLANT CASE,
Brookhaven National Lab., Upton, N.Y. Dept. Biology.
For primary bibliographic entry see Field 6G.
W76-02987

3F. Conservation In Agriculture

SPRINKLER WITH SEALED MAGNETIC RO TARY MOTION TRANSMITTIN MECHANISM,
Nelson (L.R.) Corp., Peoria, Ill. (Assignee).
J. P. King.
U.S. Patent No 3,915,383, 5 p, 10 fig, 6 ref; Of cial Gazette of the United States Patent Offic Vol 939, No 4, p 1947, October 28, 1975.

Descriptors: *Patents, *Irrigation system *Sprinkler irrigation, Irrigation design, Irrigatio efficiency, Gears, Mechanical equipment.
Identifiers: Reduction gears, Magnetic couplin Movable sprinklers.

The use of a water flow responsive turbine in sprinkler that is magnetically coupled to reductio gearing and drive means allows the reduction gea ing to be completely, effectively, and reliab sealed from the water flow by a unitary housin without impairing the movement of the turbin The use of such a unit in a sprinkler effective seals the reduction gearing while not impairing tu bine movement and also allows planetary reduc tion gears to be used. The use of planetary reduc tion gears in a sprinkler is advantageous becaus of their efficiency and because of their compac ness and small size for a given reduction. The us of mechanical drive means powered by the outpu shaft from the planetary reduction gear un operates both an oscillating linkage for a wate delivery tube and drive wheels for the sprinkle unit as a whole to move it along the ground Through the use of accessory reduction gearin and speed selecting means, the motor output shaf is able to power both such units. (Sinha-OEIS)
W76-02601

LIBRARY U. OF I. URBANA-CHAMPAIGN

COMBINATION IRRIGATION AND TEMPERATURE CONTROL SYSTEM FOR PLANTS,
R. E. Diggs.
U.S. Patent No 3,915,384, 4 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 1948, October 28, 1975.

Descriptors: *Patents, *Irrigation systems, *Irrigation practices, *Sprinkler irrigation, *Mist irrigation, Irrigation efficiency, Irrigation effects, Temperature, Frost prevention, Evapotranspiration.

An apparatus is provided which can be used both to irrigate crops and to control the temperature during either hot or cold weather and which is economical in construction and use. A fitting is used which is connected at opposite ends to a source of air under pressure and to a conduit conveying water at low pressure. The water is caused to flow over the outer surface of the fitting, and the air is caused to flow into the fitting and thence outward through openings to intercept the water to produce either a fine mist or fog of water or a spray of larger droplets of water, depending upon the air pressure utilized. This irrigates the plants and prevents freezing of the plants. For example, the fine mist or fog of water vapor produces a blanket which prevents thermal radiation from plant and soil surfaces, and the larger the droplets collect on the leaf surfaces, whereby the latent heat used to convert the vapor on the leaf surfaces to liquid and from liquid to ice warms the leaves and thus prevents freezing. The system uses about 5 gallons of water per minute per acre. The apparatus can also be used to control the temperature of plants during how weather by producing a spray of water which collects on the leaf surfaces and is then evaporated, and the heat required to convert the liquid water to vapor cools the leaves. (Sinha-OEIS)
W76-02602

WATER RESOURCES MANAGEMENT FOR PART OF THE LOWER GILA VALLEY,
Arizona Univ., Tucson, Dept. of Watershed Management.
J. M. Filho.
Ph.D. Dissertation, 1974. 130 p, 4 fig, 25 tab, 55 ref, 1 append.

Descriptors: *Water management(Applied), Drainage, *Arizona, *Saline water, *Irrigation practices, Flood control, Irrigation water, Groundwater, Water table, Irrigation effects, Colorado River, Mathematical models, Riparian plants, Sprinkler irrigation, Irrigated land, Flood irrigation.
Identifiers: Gila River(Ariz).

This study outlines past and present water management practices and problems in the Wellton-Mohawk Irrigation and Drainage District located in a valley along the Gila River in southwestern Arizona. Problems of the District include declining groundwater levels, salt accumulation, and drainage difficulties. Objectives of the study focus on better use of water resources, reduction of the risks of flood damage, and decreasing the salt content of water being diverted to Mexico. A mathematical model was developed to analyze the impact of selected management alternatives. A proposal to increase irrigated acreage and two strategies proposing reduction or elimination of riparian vegetation were judged impracticable. Increasing levels of change from flood to sprinkler irrigation (25, 50, and 100 percent) seemed a possible solution to area water problems and would substantially decrease the highly saline drainage flow into the Colorado River. Combinations of changes to sprinkler irrigation and reduction of riparian vegetation levels seemed to counteract each other in terms of drainage water to be dumped. Recommendations include restrictions on new irrigation development, some changes to sprinkler irrigation, and further studies and data collection. (Mills-Arizona)
W76-02678

AGRICULTURAL RUNOFF POLLUTES SURFACE WATERS, PART I,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-02694

BACTERIOLOGICAL QUALITY OF SURFACE RUNOFF FROM AGRICULTURAL LAND, PART II,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-02695

ACCURACY OF SOIL WATER BUDGETS BASED ON A RANGE OF RELATIONSHIPS FOR THE INFLUENCE OF SOIL WATER AVAILABILITY ON ACTUAL WATER USE,
University of New England, Armidale (Australia). Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-02715

AN ANALYSIS OF BORDER IRRIGATION FLOW,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
D. W. Fonken.
Ph.D. Dissertation, 1974. 131 p, 11 fig, 22 tab, 18 ref, append.

Descriptors: *Irrigation practices, *Border irrigation, *Irrigation engineering, *Mathematical studies, *Computer models, Irrigation, Irrigation systems, Furrow irrigation, Irrigation design, Water distribution(Applied), Infiltration, Dikes, Lateral conveyance structures, Flow, Soil water movement, Mass, Momentum equation, Mathematics, Mathematical models, Estimating equations, Computer programs.
Identifiers: Conservation of mass, Conservation of momemtum.

Border irrigation is defined by the author as the application of water to the soil by causing it to flow between parallel dikes across a sloping plane rectangular field. The dissertation describes an analysis of border irrigation flow beginning with field observations and proceeding through a mathematical analysis, to development of a mathematical model of border irrigation. The model, based on mathematical equations which satisfy the laws of conservation of mass and momentum, can predict depth and velocity of surface flow, and depth of infiltrated water at any point in a border when the slope, length, roughness, inflow rate and infiltration rate are specified. Numerical integration of the equation is accomplished by selecting finite quantities of time and space, small enough so that average numerical values can be used to represent the range of values actually occurring over the interval. Assumptions of surface shape and infiltration rate enable numerical approximation of the equations. Field run simulation validated the analysis and model with acceptable accuracy. The author poses that the model can be used by designers and operators of border irrigation systems, for classroom instruction, and could be adapted to borders with dikes across the lower end or to furrow irrigation techniques. (Michael-Arizona)
W76-02728

ECONOMIC ADJUSTMENT TO A NEW IRRIGATION WATER SOURCE: PINAL COUNTY, ARIZONA AND THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
M. A. Boster, and W. E. Martin.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 13-19, 2 tab, 7 ref. OWRT A-048-ARIZ(1).

Descriptors: *Irrigation, *Economics, *Agriculture, *Arizona, *Water delivery, Groundwater resources, Water management(Applied), Water supply, Acreage, Crop production, Salinity.
Identifiers: *Central Arizona Project, *Pinal County(Ariz).

Pinal County is one of Arizona's largest farm and highest farm income areas. Agriculture there is completely dependent upon irrigation systems, with nearly all of the water supply pumped from underlying groundwater reservoirs. Delivery of Central Arizona Project water will not assure groundwater conservation at a one to one trade-off ratio. Most of the monetary benefits to agriculture derived from the Project will be realized by Indian farmers. Cotton acreage will not be affected, but the acreage of small grains and alfalfa will increase. The increasing salinity of CAP water should be of no concern to Pinal County farmers. (McLachlan-Arizona)
W76-02737

A FIELD STUDY OF SOIL WATER DEPLETION PATTERNS IN PRESENCE OF GROWING SOYBEAN ROOTS: I. DETERMINATION OF HYDRAULIC PROPERTIES OF THE SOIL,
Minnesota Agricultural Experiment Station, St. Paul.
For primary bibliographic entry see Field 2G.
W76-02933

USE OF MAIN CANALS AND REGULATING RESERVOIRS OF IRRIGATION SYSTEMS FOR RURAL DRINKING WATER SUPPLY, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 4A.
W76-02951

WATER RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA, 1974-75,
Geological Survey, Las Vegas, Nev.
For primary bibliographic entry see Field 4B.
W76-02958

INFLUENCE OF WATER STRESS ON PARAMETERS ASSOCIATED WITH HERBAGE QUALITY OF PANICUM MAXIMUM VAR. TRICHOGLUME,
Commonwealth Scientific and Industrial Research Organizations, St. Lucia (Australia), Div. of Tropical Agronomy.
For primary bibliographic entry see Field 2I.
W76-02969

EMITTER FOR IRRIGATION SYSTEMS,
Harmony Emitter Co., Inc., Tucson, Ariz. (Assignee).
R. C. Harmony.
U.S. Patent No 3,917,169, 5 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 261, November 4, 1975.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Irrigation systems, Irrigation efficiency, Irrigation design, Water control, Flow control.
Identifiers: *Emitters.

An irrigation system has an apertured water pipe for conveying a flow of water from a source of water under pressure to each aperture and an emitter placed at each aperture of discharging water from the water pipe to the area to be irrigated. The emmitter has: a water passageway for discharging water from an aperature in the water pipe to the soil to be irrigated; a pair of elements

for supporting the water passageway within the aperture of the water pipe, one of the pair of elements extending across one part of the aperture and the other extending across another part of the aperture, which edges, in combination, define the discharge orifice of the water passageway; bias means for constricting the water passageway in response to variations in water pressure within the water pipe; and means for establishing a pressure gradient within the water passageway as a function of the water pressure within the water pipe. The rate of water discharge through the emitter is maintained at a constant rate despite variations in water pressure within the water pipe. (Sinha-OEIS)
W76-02998

PROPELLING PIPE SUPPORT TOWER FOR PIVOT IRRIGATION SYSTEMS,
E. E. Reinke.
U.S. Patent No 3,917,171, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 262, November 4, 1975.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Irrigation systems, Irrigation practices, Irrigation efficiency, Lateral conveyance structures, Equipment.

A drive system is provided for an irrigation pipe supporting tower which is capable of obtaining sufficient ground traction to drive the tower even when the tower is moving over soft ground surfaces. The drive mechanism is actuated by means of a simplified motor system wuch as a double-acting cylinder. Precise actuation of the drive means of a number of towers placed in aligned positions is carried out in order that the irrigation pipe may be maintained substantially straight. The irrigation pipe support tower is inverted V-shaped in configuration. The lower ends of the legs of the tower are equipped with ground-engaging skids and a forward power leg has its upper end engaged with the forward leg of the tower for movement. The lower end of the power leg can be projected downward and rearward relative to the tower. A double-acting hydraulic cylinder is connected between the upper apex portion of the tower and the power leg with suitable controls. The lower end of the poser leg is equipped with a large horizontal cross-sectional area foot for engagement with the ground. (Sinha-OEIS)
W76-02999

DRIP IRRIGATION METHOD,
Andco, Inc., Buffalo, N.Y. (Assignee).
R. W. Hildebrandt, and H. Hanks, Jr.
U.S. Patent No 3,917,166, 3 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 260, November 4, 1975.

Descriptors: *Patents, *Irrigation, *Surface irrigation, *Distribution systems, Irrigation practices, Irrigation systems, Irregation efficiency, Water control, Water distribution(Applied).
Identifiers: *Drip irrigation.

A drip irrigation emitter installation delivers equal amounts of water to a number of plant root areas regardless of line pressure variations. A supply of emitters of different flow potential for supplying the same given amount of water at various line pressures are provided. During installation, a predetermined head pressure and flow rate of water is maintained at the beginning of the feeder tube system and holes are successively formed in the tube where emitters are to be installed. Without regard to line pressure losses, the specific line pressure at each hole is measured and an emitter adapted to deliver the desired amount of water at such pressure is selected and installed at that location (Sinha-OEIS)
W76-03000

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

CLEARCUTTING AND BURNING SLASH ALTER QUALITY OF STREAM WATER IN NORTHERN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
G. G. Snyder, H. F. Haupt, and G. H. Belt, Jr.
U. S. Department of Agriculture, Forest Service, Research Paper INT-168, 34 p, June 1975, 26 fig, 20 ref, 5 tab.

Descriptors: *Watershed management, *Idaho, *Clear-cutting, *Burning, *Wood wastes, *Lumbering, *Water quality, *Streams, Surface waters, Rocky Mountain Region, Physical properties, Nutrients, Water properties, Electrical conductance, Bicarbonates, Sulfates, Calcium, Magnesium, Hydrogen ion concentration, Turbidity, Suspended solids, Potassium, Sodium, Chlorides, Drainage patterns(Geologic), Water pollution sources.
Identifiers: Priest River Experimental Forest(Idaho).

Three cutting units of varying size, soil, and aspect located along streams in the Priest River Experimental Forest in northern Idaho were chosen for evaluation of changes in water quality caused by clearcutting and subsequent burning of slash. Water sampling stations were established on each creek, upstream, downstream, and at clear-cut/burned areas. Except for on-site stations, buffer strips of natural vegetation were left along channels to minimize the efects of treatment. Physical and nutrient comparisons between the upstream and downstream stations showed slight increases in electrical conductivity, bicarbonate, sulfate, calcium, and magnesium. Similar comparisons between upstream and the on-site stations revealed increases in pH, electrical conductivity, turbidity, suspended solids, bicarbonate, sulfate, potassium, calcium, and magnesium. Nutrients that did not indicate increases for buffer strip comparisons were chloride and sodium. In general, larger increases were observed at the on-site stations except for one station with a different drainage pattern. (Witt-IPC)
W76-02522

CONVERSION OF CHAPARRAL TO GRASS IN CENTRAL ARIZONA: EFFECTS ON SELECTED IONS IN WATERSHED RUNOFF,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5B.
W76-02527

METHOD AND APPARATUS FOR CONTROLLING WATER FLOW FROM AN IMPOUNDED BODY OF WATER,
Fluid Dynamics Proprietory Ltd., Cape Town (South Africa).
L. A. Turner, and R. Peter.
U.S. Patent No 3,913,334, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1190, October 21, 1975.

Descriptors: *Patents, *Water control, *Flow control, *Regulated flow, *Water conveyance, Barriers, Reservoir releases, Floats, Engineering structures.

The invention provides a method of controlling the rate of flow of water from an impounded body of water (reservoir or canal), in which the water is caused to flow beneath a barrier apparatus or float. The lower part of the float is of curved configuration so that as water flows past it, it tends to act as an aerofoil. The direction of curvature of the lower part being such that the upward pressure on the underside of the float decreases with increasing rate of water flow and increases with decreasing rate of water flow. As the rate of flow depends on the difference between the water level upstream of the float and the level downstream of the float, the effect of the change of static pressure on the float is to close the barrier as the upstream level increases and open the barrier as the upstream level drops, thereby to obtain a substantially constant downstream level. It is desirable for the floor beneath the float to slope upwardly so that with the curved part of the float it effectively defines a venturi giving the optimum flow pattern. (Sinha-OEIS)
W76-02595

REGIONAL RESPONSE THROUGH PORT DEVELOPMENT: AN ECONOMIC CASE STUDY ON THE MCCLELLAN-KERR ARKANSAS RIVER PROJECT,
Arkansas Univ., Fayetteville. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W76-02623

NATURAL DISASTERS: SOME EMPIRICAL AND ECONOMIC CONSIDERATIONS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 6C.
W76-02625

LOWER SHEYENNE RIVER BASIN WATER - LAND - PEOPLE.
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 5A.
W76-02627

SOCIAL EFFECTS OF CHANGES IN USES OF BEAR LAKE, AN INTERSTATE BODY OF WATER,
Utah State Univ., Logan. Inst. for Social Science Research.
For primary bibliographic entry see Field 6B.
W76-02634

GROUNDWATER SEEPAGE AND ITS EFFECT ON SALINE SOILS,
Montana Environmental Quality Council, Helena.
For primary bibliographic entry see Field 2G.
W76-02639

CONFERENCE ON THE MANAGEMENT OF RECREATIONAL LAKES.
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 6B.
W76-02641

AQUATIC VEGETATION HARVESTING,
Dane County Dept. of Public Works, Madison, Wis.
H. Hartwig, and A. Woerpel.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972. Wisconsin University Center, Marinette County, p 47-49.

Descriptors: *Recreation, *Aquatic weed control, *Harvesting, Lakes, Rivers, *Wisconsin, Equipment, Capital costs, Operating costs.
Identifiers: Lake Mendota(Wis), Lake Monona(Wis), Lake Waubesa(Wis), Lake Kegonsa(Wis), Yahara River(Wis), Madison(Wis).

The aquatic vegetation harvesting program in the Madison, Wisconsin lakes and the Yahara River is described. The watershed runoff is rich in nutrients, thus a program of holding effluents in

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nure pits and grass waterways has been started. e overall effectiveness of the program is as yet determined. Weeds are cut by harvesters and nsferred by conveyors to trucks which trans- t them to landfills. Approximately 1 acre/hour harvested; plant density does not change this e. A strip 150 feet wide from the pier line is cut, s laterals to open water about every 500 feet en necessary. Water accounts for much of the nsported load, so methods to reduce this 50- % (by chopping, squeezing, or dewatering) are ng studied. The 100-day operation begins in y. Underwater obstacles, weather, and chanical difficulties pose problems. One per- nent employee serves as supervisor and chanic; other employees are seasonal. Dane nty has a $200,000 capital outlay for equip- nt. In 1971, 3,500 acres were harvested for less n $35,000 operational costs. The Dane county 2 weedcutting budget was $49,900 for capital ay and$44,705 for labor, fuel, equipment, and airs at a cost of 30.8 cents/person. (See also 5-02641) (Buchanan-Davidson--Wisconsin) 5-02647

ENVIRONMENTAL LAND PLANNING AP- OACH--CASE STUDY, LILY LAKE PRO- T,
consin Univ., Madison. Environmental areness Center.
primary bibliographic entry see Field 6B. 5-02649

OPERATION WITH THE SOIL CONSERVA- N SERVICE,
Conservation Service, Antigo, Wis. Resource servation and Development.
primary bibliographic entry see Field 6E. -02650

TER RESOURCES DATA FOR NEBRASKA, : PART 2. WATER QUALITY RECORDS,
ogical Survey, Lincoln, Nebr.
primary bibliographic entry see Field 7C. -02656

AL-POLITICAL HISTORY OF WATER OURCE DEVELOPMENT IN THE UPPER ORADO RIVER BASIN,
ornia Univ., Santa Barbara. Dept. of Political ace.
primary bibliographic entry see Field 6E. -02669

LTRATION CONTROL THROUGH SOIL FACE MANAGEMENT,
ultural Research Service, Tucson, Ariz. west Watershed Research Center.
rimary bibliographic entry see Field 2G. 02673

NTORY OF WATER RESOURCES EARCH IN AUSTRALIA, 1973.
alian Water Resources Council Canberra.
rimary bibliographic entry see Field 2A. 02680

LOG PEARSON TYPE 3 DISTRIBUTION ITS APPLICATION IN HYDROLOGY,
nal Inst. of Scientific Research, Quebec.
rimary bibliographic entry see Field 2E. 02701

Y OF TIME-LAPSE PROCESSING FOR MIC HYDROLOGIC CONDITIONS,
ord Research Inst., Menlo Park, Calif.
Serebreny, W. E. Evans, and E. J. Wiegman.
ble from the National Technical Informa- ervice, Springfield, Va 22161 as N75-16068, n paper copy, $2.25 in microfiche. Final report, prepared for Goddard Space Flight Center, Greenbelt, Ma., November 1974. 107 p, 29 fig, 4 tab.

Descriptors: *Hydrology, Monitoring, Measurement, Water, Snow, Vegetation, Lakes, Watersheds(Basins), Abstracts, *Data processing.
Identifiers: *ERTS Imagery, *Dynamic display, Multi-spectral analysis, Time-lapse.

The objective of this research was to investigate the usefulness of dynamic display techniques in exploiting the repetitive nature of ERTS imagery. A specially designed Electronic Satellite Image Analysis Console (ESIAC) has been developed and employed to process data for seven ERTS principal investigators studying dynamic hydrological conditions for diverse applications. These applications include measurement of snowfield extent and sediment plumes from estuary discharge, playa lake inventory, and monitoring of phreatophyte and other vegetation changes. The ESIAC providing facilities for storing registered image sequences in a magnetic video disc memory for subsequent recall, enhancement, and animated display in monochrome or color. The most unique feature of the system is the capability to time-lapse the imagery and analytic displays of the imagery. Data products have included quantitative measurements of distances and areas, binary thematic maps based on monospectral or multispectral decisions, radiance profiles, and movie loops. Applications of animation for uses other than creating time-lapse sequences are identified. Input to the ESIAC can be either digital or via photographic transparencies. Most of the project work was with transparencies for reasons of convenience, cost, and speed. (Bell-Cornell)
W76-02713

EVALUATING COSTS FOR PORT DISTRIBUTION SYSTEMS,
Board of Engineers for Rivers and Harbors, Washington, D.C.
R. G. Waugh, Jr.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 101, No WW4, Proceedings paper No 11723, p 385-392, November 1975.

Descriptors: *Harbors, *Costs, *Evaluation, Ports, Economics, Transportation, Forecasting, Planning, Constraints, Storage.
Identifiers: *Waterways(Transportation), *Economic analysis, Commodity movements, Economic data, Energy crisis.

Planning port and inland distribution systems necessitates the investigation of highly complex systems for which manageable solutions must be found; often the tools of analysis may not be readily available. Significant steps of analysis should include: (1) proper identification of the relevant system and alternatives; (2) compilation of meaningful data on transportation flows and costs for alternative modes with due qualification of such data's utility; (3) recognition of constraints on system capacity; and (4) evaluation of the significance of time and quality of service in transportation alternatives. To evaluate alternative modes for distributing commodities to markets, the relevant distribution system must be identified. The basis for choice between modes for a specific commodity movement will be based on total system costs, including line-haul transport, transfer and storage, and such items as the value of time in transit. Systems evaluation should also consider transport capacity and competitive sources of commodity supply to serve the market under study. For specific movements, suitable data on commodity flows and transportation costs will generally not be available to most investigators. Recognizing that most traffic moves on the basis of current rates, not costs, modeling of transportation distribution systems will be imperfect. Problems in identifying system components and satisfying data requirements are examined. (Bell-Cornell)
W76-02716

ANALYSIS AND MANAGEMENT OF WATER DISTRIBUTION SYSTEMS,
National Inst. of Scientific Research, Quebec.
H. Demard, B. Bobee, and J-P. Villeneuve.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol 101, No UP2, Proceedings paper No 11679, p 167-182, November 1975. 5 fig, 3 tab, 3 equ, 36 ref.

Descriptors: *Water distribution(Applied), *Planning, *Design, *Management, Control, Networks, Operations, Pricing, Water demand, Assessment, Equations, Canada.
Identifiers: *Urban development, *Water consumption, Residences, Balancing techniques.

An integral approach to the management of urban water distribution systems is described, having as its objective the synthesis of the following elements: the planning, design, operation and control of the network, and the pricing of the resulting service. Analysis of the problem necessitates the use at various levels of different balancing techniques and suggests the need for data concerning the structure of the consumer demand (in time and space) for individual consumers and for defined user groups. Accordingly, a study has been made of the variations of consumer demand, on a time scale varying from 1 min. to 1 day, in representative single family and multiple family dwellings in two cities, Sherbrooke and Sainte-Foy (Province of Quebec, Canada). For the latter municipality, a study of the possible control of the water distribution system in real time, as a function of predicted consumer demand is described. Finally, a pricing structure based on the observed variations of the consumer demand is proposed.
W76-02718

MULTIOBJECTIVE PLANNING OF WATER AND LAND RESOURCES,
For primary bibliographic entry see Field 6B.
W76-02721

PREDICTING SPRING STREAMFLOW IN CENTRAL ARIZONA,
Oregon State Univ., Corvallis. School of Forestry.
R. L. Beschta, and D. B. Thorud.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 715-727, 3 fig, 2 tab, 8 ref.

Descriptors: *Streamflow forecasting, *Snowmelt, *Runoff, Precipitation(Atmospheric), *Synthetic hydrology, *Simulation analysis, *Arizona, Floods, Hydrographs, Streamflow, Runoff forecasting, Snowpacks, Water equivalent, Water yield, Recession curves, Soil moisture, Rainfall, Storms, Semiarid climates, River forecasting, River basins, Hydrologic data, Model studies, Rainfall-runoff relationships.
Identifiers: *Salt River Basin(Ariz), Recession analysis, Streamflow synthesis, Streamflow synthesis and reservoir regulations model.

This study consideres two alternative methods of forecasting future runoff in the 4,306 square mile Salt River Basin in central Arizona: (1) recession analysis and (2) streamflow synthesis. The recession analysis attempts to evaluate the memory or history of flow patterns on the basin whereas streamflow synthesis attempts to simulate hydrologic processes, particularly those affecting snowpact ablation, and changes in soil moisture storage. Under conditions where the recession coefficient (K sub r) associated with a rainfall event is low (during the late fall months when soil moisture is low), the recession analysis has limited

predictive capability. However, during the late winter or spring months, soil moisture levels are typically higher and the predictive capability is improved. In using the streamflow synthesis and reservoir regulation model, the magnitude of the predicted flow is related primarily to the existing snowpact water equivalent and soil moisture conditions on the prediction date. With no snow on the basin, use of this model offers no improvement over recession predictions, but as snow storage increases, the predictive capabilities using a simulation model are enhanced. Estimated flows using the simulation model were generally 2.5 to 3 times higher than those obtained by recession analysis. Because both methods did not utilize estimates of precipitation after the forecast date, they provided conservative predictions of expected flow volumes. (Robinett-Ariz)
W76-02724

IMPROVED STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMAL RESERVOIR OPERATION BASED ON THE ASYMPTOTIC CONVERGENCE OF BENEFIT DIFFERENCES,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. Guitron de los Reyes.
M. S. Thesis, 1974, 58 p, 8 fig, 4 tab, 18 ref, 2 append.

Descriptors: *Stochastic processes, *Mathematical studies, *Computer programs, *Dynamic programming, *Reservoirs, Markov processes, Model studies, Linear programming, Statistical models, Inflow, Streamflow, Operations, Equations, Operations research.

A new interative scheme is presented for stochastic dynamic programming which is more efficient than the conventional stochastic dynamic approach for calculating optimal operating rates for a single reservoir system. The scheme presented is composed of the conventional programming procedure alternated with iterations over a fixed policy to increase the chance of finding the optimal policy more rapidly. The thesis introduces a refined technique for deriving transition probability matrices and the use of bounded variables in the recursive equation thereby providing a simpler way to verify convergence of the cyclic gain of the system. A computer program capable of implementing the new iterative scheme is presented in the appendices, and results of real application are presented to derive quantitative comparisons. The new iterative scheme is shown to save 25 percent of the computational time required with the conventional procedure. (Michael-Arizona)
W76-02729

STREAMFLOW HYDROLOGY AND SIMULATION OF THE SALT RIVER BASIN IN CENTRAL ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
R. L. Beschta.
Ph.D. Dissertation, 1974, 140 p, 33 fig, 7 tab, 57 ref, 4 append.

Descriptors: *Streamflow forecasting, *Simulation analysis, *Snowmelt, *Runoff, *Precipitation(Atmospheric), *Arizona, Synthetic hydrology, Floods, Hydrographs, Streamflow, Runoff forecasting, Snow, Water equivalent, Water yield, Recession curves, Soil moisture, Rainfall, Semiarid climates, River forecasting, River basins, Hydrologic data, Model studies, Rainfall-runoff relationships.
Identifiers: *Salt River Basin(Ariz), Salt River(Ariz), Streamflow synthesis and reservoir regulation model.

The unpredictable nature of precipitation and resultant runoff in arid and semi-arid regions has often limited the development and use of surface water resources. In the case of the Salt River, streamflow resulting from winter precipitation generally occurs at a time of year when reservoir withdrawals are at a minimum and, during years of above average carry-over storage and high runoff, the probability of releases and spills increases. In order to study winter streamflow from the Salt River Basin, a continuous simulation streamflow model was evaluated and used. Simulated hydrographs of the streamflow synthesis and reservoir regulation model generally underestimated peak flows and overestimated recession flows following major rainfall events. The standard error of the estimate for simulated winter flows (November through May) was 30,000 acre-feet for the calibration period but increased to approximately 120,000 acre-feet for the validation period. About 25 to 45 percent of the winter runoff occurring after February 1, March 1 and April 1 could be predicted from simulated snowpack water equivalent and soil moisture conditions on the prediction date. For a selected winter period, simulations indicated streamflow response to a one-inch change in winter precipitation would be approximately 100,000 acre-feet, or 3.4 times greater than expected from a one-degree change in winter temperature. (Robinette-Arizona)
W76-02731

STATE WATER PLANNING,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E.
W76-02735

THE GEOMORPHIC AND HYDRAULIC RESPONSE OF RIVERS,
Colorado State Univ., Fort Collins. Coll. of Engineering.
For primary bibliographic entry see Field 2E.
W76-02738

DESCRIBING SNOWPACKS IN ARIZONA MIXED CONIFER FORESTS WITH A STORAGE-DURATION INDEX,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2C.
W76-02744

FILTRATION OF DRAINAGE ELEMENT,
A. G. Bayer.
Belgian Patent 802,943, Applied July 30, 1973, Issued January 30, 1974. Derwent Belgian Patents, Vol 5, No 7, March, 1974.

Descriptors: *Filtration, *Drainage systems, *Groundwater, *Surface water, Fabrics, *Patents.

A filtration or drainage system for ground and surface water around foundations and in embankments is described. It consists of two mutually parallel textile articles of large surface formed from synthetic or other rot resistant fibers with a water discharge zone between them. (Merritt-FIRL)
W76-02838

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 4C.
W76-02865

SNOWMELT RUNOFF EFFICIENCIES ON ARIZONA WATERSHEDS,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
For primary bibliographic entry see Field 2C.
W76-02866

CHARACTERIZATION OF SNOWMELT RUNOFF EFFICIENCIES,
Forest Service (USDA), Silver City, N. Mex. Gi
National Forest.
For primary bibliographic entry see Field 2C.
W76-02871

COMPUTING THE BIG PICTURE,
Colorado State Univ., Fort Collins. Dept. of Civ
Engineering.
For primary bibliographic entry see Field 3D.
W76-02874

DEVELOPMENT OF REGIONAL SUPPL FUNCTIONS AND A LEAST-COST MODE FOR ALLOCATING WATER RESOURCES I UTAH: A PARAMETRIC LINEAR PRO GRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineerin
and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W76-02876

FORMULATION OF NONSTRUCTURA FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environment
Resources Center.
For primary bibliographic entry see Field 6F.
W76-02879

RESERVOIR PROJECT ENVIRONMENTA STUDY,
Iowa State Water Resources Research Inst
Ames.
For primary bibliographic entry see Field 6B.
W76-02880

A STUDY OF MINNESOTA FORESTS AN LAKES USING DATA FROM EART RESOURCES TECHNOLOGY SATELLITES TWENTY-FOUR MONTH PROGRESS REPORT
Minnesota Univ., Minneapolis. Space Science Center.
Available from the National Technical Informa tion Service, Springfield, Va. 22161, as N75-1242 $7.50 in paper copy, $2.25 in microfiche. Twenty four Month Progress Report, June 30, 1974. 240 NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Minnesota, *Lak Superior, *Hydrology, *Satellites(Artificial Water quality, Forest management Watersheds(Basins), Vegetation, Snowmelt, Cu rents(Water), Lakes, Turbidity, Saline soils, Clas sification, Flood forecasting.
Identifiers: *ERTS, *Forest disease detection *Red River Valley(Minn).

Research activities for the second year of th Remote Sensing Program were reviewed. Titles o the twelve reports presented were: Forest Diseas Detection and Control; Evaluation of Water Quali ty by Remote Sensing Techniques; Forest Vegeta tion Classification and Management; Detectin Saline Soils in the Red River Valley, Minnesota by Remote Sensing Techniques; Use of ERT Imagery to Assist in Snowmelt Flood Prediction Remote Sensing Applications to Hydrology i Minnesota; Rice Creek Watershed Project Management of Hydrologic Features in West Cen tral Minnesota from ERTS-1 Imagery; Remot Sensing in Lake Superior Studies; Remote Sensin in Western Lake Superior; Use of ERTS in Mea surements of Water Quality in Lake Superior an the Duluth Superior Harbor; and Determination o Lake Superior Currents from Turbidity Pattern Observed from ERTS. (See W76-02902 thru W76 02908) (Humphreys-ISWS)
W76-02901

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REST DISEASE DETECTION AND CONOL,
nnesota Univ., St. Paul. Dept. of Plant Patholo-

primary bibliographic entry see Field 2I.
6-02902

AULATION OF WATER QUALITY BY MOTE SENSING TECHNIQUES,
nnesota Univ., St. Paul. Dept. of Forest Biolo-

primary bibliography entry see Field 5A.
6-02903

REST VEGETATION CLASSIFICATION D MANAGEMENT,
nnesota Univ., St. Paul. Inst. of Agriculture
note Sensing Lab.
P. Meyer.
A Study of Minnesota Forests and Lakes ng Data from Earth Resources Technology ellites; Twenty-four Month Progress Report, nnesota University, Minneapolis, Space nce Centter, p 39-52, June 30, 1974. 3 fig, 1 2 ref. NASA NGL 24-005-263.

criptors: *Remote sensing, *Aerial photogny, *Forests, *Minnesota, Management, est management, Project planning, Costs, nomics, Efficiencies, Vegetation, Classifications, Surveys, Data collections.

resentatives of the Minnesota Department of ural Resources, the College of Forestry, Minota's forest industries, land commissioners of forested counties and the U.S. Forest Service e cooperated over a period of years in develop a comprehensive plan for precurement of con ing, high quality, aerial photography of Minota's forests. This plan was recently approved he Minnesota State Legislature and funded for irst biennium of operation. To insure quality erage, the College of Forestry drafted the basic act specifications and established a system of erials inspection. To test the possible future of smaller photo scales (1:24,000 or 1:31,680), thereby realize further economies of purchase interpretation, sample test sites will be flown currently with the 1:15,840 current coverage in nomen, Lake of the Woods, and Becker nties in 1974. Upon completion of these overts, local user-cooperators will compare the ive applicability of the smaller scales of rage in lieu of the conventional (1:15,840) rage (See also W76-02901) (Sims-ISWS)
-02904

ECTING SALINE SOILS IN THE RED ER VALLEY, MINNESOTA,
nesota Univ., St. Paul. Dept. of Soil Science.
primary bibliographic entry see Field 2G.
-02905

OF ERTS IMAGERY TO ASSIST IN SNOWT FLOOD PREDICTION,
nesota Univ., Minneapolis. Dept. of Civil and ral Engineering.
primary bibliographic entry see Field 2C.
-02906

OTE SENSING APPLICATIONS TO ROLOGY IN MINNESOTA,
esota Univ., Minneapolis, Dept. of Geog-.
own, and R. Skaggs.
A Study of Minnesota Forests and Lakes g Data from Earth Resources Technology lites; Twenty-four Month Progress Report, esota University, Minneapolis, Space ce Center, p 81-196, June 30, 1974. 3 fig, 35 append. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Satellites(Artificial), *Minnesota, Runoff, Watersheds(Basins), Surface waters, Mapping, Wetlands, Urban hydrology, Water quality, Lakes, Seasonal, Surveys, Hydrology.
Identifiers: *ERTS.

Two years efforts have been directed toward the application of satellite and high altitude photographic imagery to a variety of hydrologic problems. The studies included: (1) the investigation of surface cover data to develop surface runoff coefficients for noninstrumented watersheds, described in the appended Rice Creek Watershed Project final report; (2) the detection of surface water and seasonal surface water changes with ERTS imagery, reported in the appended MA thesis; (3) the application of ERTS-1 MSS imagery to the detection of Peaty Wetlands; (4) the application of high altitude aerial photography and manually interpreted and density sliced ERTS-1 images to the development of an urban hydrologic model for the Twin Cities Metropolitan Area; and (5) the investigation of multi-seasonal ERTS-1 imagery for classification of lake quality in Minnesota. (See also W76-02901) (Sims-ISWS)
W76-02907

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W76-02908

A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-02928

GEOMORPHIC PROCESSES ACTIVE IN THE SOUTHWESTERN LOUISIANA CANAL, LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 2J.
W76-02930

TRANSIENT FLOW ROUTING IN CHANNEL NETWORKS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 8B.
W76-02941

REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHLY MEAN SUBTRACTION,
Purdue Univ., Lafayette, Ind. Schools of Engineering.
For primary bibliographic entry see Field 2A.
W76-02944

USE OF MAIN CANALS AND REGULATING RESERVOIRS OF IRRIGATION SYSTEMS FOR RURAL DRINKING WATER SUPPLY, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. V. Tsapko, G. I. Meleshko, and L. N. Vanyurikhina.
Gig Sanit, 9, 91-92, 1974.

Descriptors: *Water supply, Potable water, *Irrigation systems, Canals, *Irrigation canals, *Reservoir operation, Biochemical oxygen demand, Oxidation, Water quality, Algae, Water sources, Cattle, Regulation.
Identifiers: Ukrainian-SSR, *USSR.

In some irrigation systems in the S Ukrainian SSR (USSR), the transparency of the water in the main canals increased and the oxidizability and biochemical oxygen demand decreased. Water quality improved even more in the regulating reservoirs, which were natural settling tanks. Water quality degradation was noted in the canals and reservoirs only at places of unorganized bathing and water of cattle. The canals had no algal growth due to their considerable depth and fast current. Canals and reservoirs are thus suitable as water sources for rural water mains.--Copyright 1975, Biological Abstracts, Inc.
W76-02951

ON THE VALUE OF INFORMATION TO FLOOD FREQUENCY ANALYSIS,
Geological Survey, Reston, Va.
J. R. Slack, J. R. Wallis, and N. C. Matalas.
Water Resources Research, Vol 11, No 5, p 629-647, October 1975. 11 tab, 4 ref.

Descriptors: *Flood frequency, *Mathematical models, *Stochastic processes, *Monte Carlo method, *Synthetic hydrology, Evaluation, Statistical methods, Time series analysis, Simulation analysis, Streamflow, Optimum development plans, Design flood, Cost-benefit analysis.
Identifiers: *Water resources planning.

A set of Monte Carlo experiments was carried out to assess the sensitivity of the design losses associated with flood damage reduction measures to the following factors: the underlying distribution of floods, the assumed distribution of floods, the skewness of floods, the length of observed flood sequences, the design return period, the measure of shape of the loss functions, and the measure of relative scale of the over-design loss functions. On the basis of Monte Carlo experiments, the use of the normal distribution to represent the distribution of floods is generally better than either the Gumbel, log normal, or Weibull distributions. (Woodard-USGS)
W76-02952

LOW STREAMFLOW CHARACTERISTICS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-02955

THE EFFECT OF SURFACE DRAINAGE AND SUBSEQUENT STAND CUTTING ON CHANGES OF THE GRASS-MOSS COVER, (IN RUSSIAN),
For primary bibliographic entry see Field 2I.
W76-02956

THE BLACK HILLS-RAPID CITY FLOOD OF JUNE 9-10, 1972: A DESCRIPTION OF THE STORM AND FLOOD,
National Weather Service, Silver Spring, Md; and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-02967

4B. Groundwater Management

A REVIEW OF THE POTENTIAL APPLICATIONS OF REMOTE SENSING TECHNIQUES TO HYDROGEOLOGICAL STUDIES IN AUSTRALIA,
Newcastle Univ. (Australia). Dept. of Physics.
For primary bibliographic entry see Field 7B.
W76-02534

HAMMER SEISMIC TIMING AS A TOOL FOR ARTIFICIAL RECHARGE SITE LOCATION,
Agricultural Research Service, Fresno, Calif. Water Managment Research.
W. C. Bianchi, and H. I. Nightingale.

Soil Science Society of America Proceedings, Vol 39, No 4, p 747-751, July-August 1975. 4 fig, 4 tab, 14 ref.

Descriptors: *Seismology, *On-site investigations, *Groundwater, *Artificial recharge, *Water spreading, *California, Seismic properties, Seismic waves, Travel time, Seismic studies, Alluvial aquifers, Aquifers, Geophysics, Exploration, Equipment, Groundwater recharge, Recharge ponds, Sites.
Identifiers: *Leaky Acres recharge area(Calif), *Hammer seismic timing, *Alluvial geology, *Site selection.

Hand-carried hammer impact seismic timing equipment utilizes the physics of seismic wave refraction to explore stratigraphic changes deeper than those found on soils maps. In alluvial areas, artificial recharge and liquid waste disposal sites were selected from sandy, single-grained soil series noted for their high water-transmitting properties through the surface 2m. The surface horizon sesmic velocity exhibited by these soils in the San Joaquin Valley had a very narrow range (V sub 1 = 315-440 m/sec), which gave good definition to the refraction off the second horizon (V sub 2 = 610-2,100 m/sec). Accurate information on depth and horizontal continuity of this second horizon could be obtained in areal surveys. A third horizon may often be described, but its areal continuity is usually masked by intermediate discontinuous layers above it of equal or lesser refractivity. All these horizons are of hydraulic significance for groundwater recharge by water spreading. (Prickett-ISWS)
W76-02556

THE STUDY OF GROUND WATER MOVEMENT IN SELECTED AREAS OF NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W76-02628

GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 2. AN EVALUATION OF THERMAL WATER IN THE BRUNEAU-GRAND VIEW AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, Idaho.
H. W. Young, R. L. Whitehead, D. B. Hoover, and C. L. Tippens.
Idaho Department of Water Resources, Boise, Water Information Bulletin No 30, July 1975. 126 p, 11 fig, 5 tab, 30 ref, 2 append.

Descriptors: *Geothermal studies, *Thermal water, *Chemical analysis, *Water temperature, *Idaho, Geology, Water types, Sampling, Data collections, Geochemistry, Aquifer characteristics.
Identifiers: *Bruneau-Grand View(Idaho).

The Bruneau-Grand View area occupies about 1,100 sq mi in southwest Idaho and is on the southern flank of the large depression (possibly a graben) containing the western Snake River Plain. The igneous and sedimentary rocks range in age from Late Cretaceous to Holocene. They are transected by a prominent system of north-west-trending faults. The aquifers have been separated into two broad units: (1) the volcanic-rock aquifers, and (2) the overlying sedimentary-rock aquifers. The Idavada Volcanics or underlying rock units probably constitute the reservoir that contains thermal water. An audio-magnetotelluric survey indicated that a large conductive zone having apparent resistivities approaching 2 ohm-metres underlies a part of the area at a relatively shallow depth. Chemical analysis of 94 water samples collected in 1973 show that the thermal waters are of a sodium bicarbonate type. Although dissolved-solids concentrations of water ranged form 181 to 1,1000 mg/litre in the volcanic-rock aquifers, they were generally less than 500 mg/litre. Measured chloride concentrations of water in the volcanic-rock aquifers were less than 20 mg/litre. Temperatures of water from wells and springs ranged from 9.5 deg to 83.0 deg C. Temperatures of water from the volcanic-rock aquifers ranged from 40.0 deg to 83.0 deg C, whereas temperatures of water from the sedimentary-rock aquifers seldom exceeded 35 deg C. Aquifer temperatures at depth, as estimated by silica and sodium-potassium-calcium geochemical thermometers, probably do not exceed 150 deg C. However, a mixed-water geochemical thermometer indicates that temperatures at depth may exceed 180 deg C. The gas in water from the volcanic-rock aquifers is composed chiefly of atmospheric oxygen and nitrogen. Methane gas was also found in some water from the sedimentary-rock aquifers. The thermal waters are believed to be heated by deep circulation in a zone of high geothermal gradient resulting from thinning of the earth's crust. (See also W75-10147) (Woodard-USGS)
W76-02655

WATER RESOURCES DATA FOR NEBRASKA, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 7C.
W76-02656

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1973.
Australian Water Resources Council Canberra.
For primary bibliographic entry see Field 2A.
W76-02680

STIMULATION OF GEOTHERMAL AQUIFERS,
Stanford Univ., Calif. Dept. of Civil Engineering.
P. Kruger, and H. J. Ramey, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 054, $5.00 in paper copy, $2.25 in microfiche. Report No NSF-RA-N-73-105, March 1973. 91 p, 8 fig, 7 tab, 55 ref, 1 append. NSF GI-34925.

Descriptors: *Geothermal studies, *Model studies, *Explosions, *Environmental effects, Thermal water, Heat flow, Aquifers, Computer models, Mathematical models, Heat transfer, Porous media, Thermal conductivity, Nuclear explosions, Flow, Groundwater, Water quality, Energy, Underground.
Identifiers: *Geothermal aquifers, *Stimulation, Explosion-produced chimney, Two-phase flow, In-place boiling, Flash fronts.

The three major objectives of the program were: (1) development of experimental and numerical data to evaluate the optimum performance of explosion-stimulated geothermal aquifers; (2) development of a geothermal steam reservoir model to evaluate the many thermophysical, hydrodynamic, and chemical parameters involved; and (3) development of a laboratory model of an explosion-produced chimney to obtain experimental data on the processes of in-place boiling, moving flash fronts, and two-phase flow in hot porous media, as well as chemical and radiochemical data for the fluids production. The progress achieved during the initial period of the project was reported in this first progress report. (Sanderson-ISWS)
W76-02685

GROUNDWATER POLLUTION CONTROL IN AN INDUSTRIALIZED PART OF THE TRENT BASIN,
Trent River Authority (England).
For primary bibliographic entry see Field 5G.
W76-02691

THE USE OF A DIGITAL MODEL IN T MANAGEMENT OF THE CHALK AQUIFER THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Read (England). Central Water Planning Unit.
D. A. Nutbrown, R. A. Downing, and R. A. Monkhouse.
Journal of Hydrology, Vol 27, No 1/2, p 127-1 October 1975. 8 fig, 1 tab, 7 ref.

Descriptors: *Aquifer manageme *Groundwater, *Movement, *Computer mod *Dynamic programming, Effects, Infiltrati Water policy, Decision making, Hydrology, timization, Pumping, Water distribution(Applie Forecasting, Saline water intrusion, Stora Water levels, Water yield improvement, Rainf Artificial recharge, Estimating, Operati research, Systems analysis.
Identifiers: *Chalk Aquifer(South Downs gland), Maximum yield, Abstraction.

A digital model has been used to describe transient effects of natural infiltration and abstr tion on the movement of groundwater and to ass with the longterm management of the Ch aquifer of the South Downs. The primary aim the study reported herein was to estimate the ma imum yield of the aquifer, bearing in mind the portant limiting factor that it is susceptible saline intrusion, both from the sea and from ti rivers. After the model was calibrated, several periments were performed with reference to long-term development and operation of aquifer. Abstraction regimes, designed to ma imize final storage in the aquifer, were generat automatically by the model using a dynamic pr gramming approach. Under conventional metho of development, the conditions likely to prevail the limit of development, particularly at the end an extended period of limited infiltration, were vestigated and their influence on future manag ment proposals considered. The possibility of tending the development limit by means of artif cial recharge was also studied using the mode (Bell-Cornell)
W76-02714

APPLICATION OF THE SAGAR METHOD FO THE SOLUTION OF THE INVERSE PROBLE IN GROUND-WATER HYDROLOGY,
Arizona Univ., Tucson. Dept. of Hydrology an Water Resources.
For primary bibliographic entry see Field 2F.
W76-02730

GROUNDWATER POLLUTION FROM SANITA RY LANDFILL LEACHATE, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resource Research Center.
For primary bibliographic entry see Field 5A.
W76-02733

ECONOMIC ADJUSTMENT TO A NEW IR RIGATION WATER SOURCE: PINAL COUN TY, ARIZONA AND THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-02737

THE APPLICATION OF STEP-DRAWDOWN PUMPING TESTS FOR DETERMINING WELL LOSSES IN CONSOLIDATED ROCK AQUIFERS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
V. W. Uhl, Jr., V. G. Joshi, A. Alpheus, and G. Sharma.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology

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ection, Arizona Academy of Science, April 11-2, 1975, Tempe, Arizona, p 133-146, 2 fig, 3 tab, l ref.

escriptors: *Aquifers, *Step-downs, Drawdown, *Water level fluctuations, *Pumping, Wells, Water levels, Transmissivity, Rock properties.
dentifiers: India.

nalysis of step-down test data enables the quanfication of the components of drawdown due to ormation of aquifer loss, and due to well losses in pumped well. This technique has been used to st approximately 100 wells that were drilled in rystalline and basalt formations in central India. nomalies in test analysis often proved helpful for terpreting aquifer irregularities. In general, the ell loss constant decreased with an increase in ecific capacity and the aquifer loss constant ecreased with increasing transmissivity. Signifiant reductions in specific capacity during a step st occurred in wells with high well losses. An atmpt was made to quantify the well losses in a onsolidated rock well. A number of practical apications of step-drawdown tests are discussed. McLachlan-Arizona)
776-02747

ATER RESOURCES OF THE WOODY MOUNAIN WELL FIELD AREA, COCONINO COUNY, ARIZONA,
orthern Arizona Univ., Flagstaff.
. L. Montgomery, and R. H. DeWitt.
: Vol 5: Hydrology and Water Resources in rizona and the Southwest, Proceedings of the 975 Meetings of the Arizona Section, American ater Resources Association and the Hydrology ction, Arizona Adacemy of Science, April 11-, 1975, Tempe, Arizona, p 147-158, 6 fig, 1 tab, 5 f.

escriptors: *Water resources, *Arizona, *Wells, Groundwater availability, *Recharge, ithdrawal, Well data, Well spacing, aults(Geologic), Groundwater, Aquifers.
entifiers: Woody Mountain, Coconono Coun-(Ariz), Oak Creek Fault(Ariz).

onclusions drawn from a water resources study the Woody Mountain area are: the average efficients of transmissibility and of storage of e principal aquifer are approximately 30,000 d/ft and 0.05 respectively; drawdown in wells is eater than predicted using theoretical calculaons due to the turbulent flow near the well bore the fractured coconino aquifer; the computed terference between pumped wells in the field nges from 10.5 ft. to 19.7 ft. Interference would negligible between wells spaced at distances eater than 6,000 ft. for pumping periods as long two hundred days; the negative boundary effect off-set on the Oak Creek Fault may be balanced the recharge effect of groundwater located in e highly permeable fractured zone afjacent to e fault; and the quantity of recharge water to the ll field is greater than withdrawals from the lls. (McLachlan-Arizona)
76-02748

HEMISTRY OF EFFERVESCING GROUNATER FROM MUNICIPAL WELLS, FLAGAFF, ARIZONA,
orthern Arizona Univ., Flagstaff.
C. Germ, and E. L. Montgomery.
Vol 5: Hydrology and Water Resources in izona and the Southwest, Proceedings of the 75 Meetings of the Arizona Section, American ater Resources Association and the Hydrology ction, Arizona Academy of Science, April 11-, 1975, Tempe, Arizona, p 159-167, 3 fig, 3 tab, 4 .

scriptors: *Effervescence, *Groundwater, Vells, *Arizona, *Groundwater recharge, Gases, uifers, Chemical analysis.
ntifiers: Flagstaff(Ariz).

Gas which effervesces from groundwater from Flagstaff's municipal wells is derived from dissolved atmospheric air. Groundwater from the Coconino aquifer at the Flagstaff municipal wells is classified as calcium magnesium bicarbonate sulfate water and is similar to groundwater pumped from the Coconino aquifer by other wells in the flagstaff area. The source of the gas which effervesces from groundwater pumped by the municipal wells is believed to be air which is trapped in the Coconino aquifer during recharge. (McLachlan-Arizona)
W76-02749

TRANSFORMATIONS IN QUALITY OF RECHARGING EFFLUENT IN THE SANTA CRUZ RIVER,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5E.
W76-02750

SALT BALANCE IN GROUNDWATER OF THE TULARE LAKE BASIN, CALIFORNIA,
K. D. Schmidt.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, Ameridan Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 177-184, 1 fig, 2 tab, 7 ref.

Descriptors: *Salt balance, *Water management(Applied), *Water quality, *Groundwater, *Irrigation efficiency, Irrigation water, California, Water importing, Monitoring.
Identifiers: Tulare Lake Basin(Calif).

The Tulare Lake Basin at the base of the Sierra Nevada Mountains is the basis for water supply for several cities and a highly productive agricultural area. Little attention has been given to groundwater quality during the past one hundred years. A careful study of the salt balance produced a set of guidelines for future groundwater managers to follow. The major emphasis for future water consumption should be the efficient use of irrigation. This would produce a positive impact on groundwater quality, energy savings, and less imported water would be needed. Groundwater management in the future must consider water quality as well as quantity. Appropriate monitoring programs are urgently needed to provide data on trends in groundwater quality. (McLachlan-Arizona)
W76-02751

CONJUNCTIVE AVAILABILITY OF SURFACE AND GROUND WATER IN THE ALBUQUERQUE AREA, NEW MEXICO: A MODELLING APPROACH,
Maine Univ., Orono. Dept. of Civil Engineering.
W. F. Brutsaert, and T. G. Gebhard, Jr.
Ground Water, Vol 13, No 4, p 345-353, July-August 1975. 9 fig, 4 tab, 6 ref. OWRT B-016-NMEX (7).

Descriptors: *Surface-groundwater relationships, *Conjunctive use, *Model studies, *Simulation analysis, *Available water, *New Mexico, Water management(Applied), Aquifer systems, Computer models, Forecasting, Regression analysis, Groundwater, Water resources development, Groundwater basins, Groundwater potential.
Identifiers: *Albuquerque(NMex), *Aquifer response.

The relationship of dynamic ground-water availability and aquifer behavior under projected stresses was modeled by a groundwater system simulator based on a mass balance of the hydrologic basin. Conditions from extreme dry to extreme wet were modeled, combined with a range of different water demands. A vast amount of information was thus obtained in the form of aquifer responses for different conditions. An analogous relationship was constructed from these data by stepwise multiple regression analysis of the change in water-table elevation for the time period considered, the water-table elevation at the end of the previous time period, and a lump factor combining surface-water inflow and outflow, precipitation, and beneficial and nonbeneficial water uses. Other results readily obtainable from the simulation runs were river accretion or depletion curves as a function of time. These curves showed the diversion effects of groundwater pumping upon the river. (Prickett-ISWS)
W76-02936

COMPARATIVE STUDY OF FRESH-SALT WATER INTERFACES USING FINITE ELEMENT AND SIMPLE APPROACHES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-02940

A DIRECT METHOD FOR THE IDENTIFICATION OF THE PARAMETERS OF DYNAMIC NONHOMOGENEOUS AQUIFERS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2F.
W76-02943

GROUND WATER FOR IRRIGATION IN THE VIKING BASIN, WEST-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
M. S. McBride.
Available from NTIS, Springfield, Va 22161 as PB-246 565, $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 23-75, October 1975. 48 p, 21 fig, 2 plate, 7 tab, 13 ref.

Descriptors: *Supplemental irrigation, *Groundwater basins, *Aquifer characteristics, *Environmental effects, *Minnesota, Water supply, Groundwater resources, Glacial drift, Drawdown, Water quality, Data collections, Water yield, Model studies, Available water.
Identifiers: *Outwash plains, *Viking basin(Minn), *Glacial outwash.

The Viking Basin consists of six glacial outwash areas in Douglas, Ottertail, and Todd Counties, west-central Minnesota. Total area is 340 square miles (880 square kilometres). Soils are sandy and excessively well-drained. Crops grown on the outwash would benefit from supplemental irrigation. Irrigation supplies can be obtained from wells in the surface aquifer in significant parts of the large outwash areas near Carlos and Parkers Prairie and the small outwash area near Clotho. Irrigation supplies are unlikely in the outwash areas near Alexandria, Urbank. and Rose City. Major use of groundwater for irrigation may lower groundwater levels sufficiently to affect lake and marsh levels and streamflow out of the irrigation areas. Water from the outwash is of excellent chemical quality for irrigation. (Woodard-USGS)
W76-02949

GROUND-WATER RESOURCES OF AMERICAN SAMOA WITH EMPHASIS ON THE TAFUNA-LEONE PLAIN, TUTUILA ISLAND,
Geological Survey, Honolulu, Hawaii.
C. B. Bentley.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 289, $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 29-75, September 1975. 33 p, 3 fig, 2 plate, 1 tab, 17 ref, append.

Descriptors: *Groundwater resources, *Water quality, *Islands, *Pacific Ocean, *Surface-groundwater relationships, Hydrogeology,

Aquifer characteristics, Observation wells, Water wells, Water yield, Water table, Perched water, Saline water-freshwater interfaces, Water resources development.
Identifiers: *American Samoa, *Tutuila Island(Samoa), Tafuna-Leone plain.

This report describes the availability and chemical quality of the groundwater in the American Samoa islands. Groundwater is being developed as the principal water-supply source and the most promising area for development on Tutuila Island is the Tafuna-Leone plain. The aquifers are located in thin-bedded basaltic flows, tuff, and cinders and in underlying beach and lagoonal sedimentary deposits. Aquifers are basal-type with a freshwater lens floating on saltwater and capable of producing about 200 gpm (gallons per minute) to wells. Groundwater on Aunu'u, Ta'u, Ofu, and Olosega occurs as basal groundwater and as perched or high-level water. Yields are small but the central part of Ta'u may contain large quantities of high-level water. The fresh groundwater quality generally is good and meets standards set for drinking water by the U.S. Public Health Service. However, seawater intrusion can be a problem in wells that tap the basal lens. (Woodard-USGS)
W76-02950

WATER RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA, 1974-75,
Geological Survey, Las Vegas, Nev.
J. D. Larson.
Open-file report, 1975. 12 p, 7 fig, 1 tab, 2 ref.

Descriptors: *Basic data collections, *Groundwater resources, *Water level fluctuations, *Spring waters, *Irrigation, Water yield, Water utilization, Withdrawal, Irrigation wells, Deserts, *Nevada, Collapse, Faults(Geologic), Sagponds.
Identifiers: *Devils Hole area(Nev).

The Geololgical Survey collected water-level, spring-flow, and power-consumption data in the Devils Hole area, Nevada, from July 1974 through June 1975. The work for this third annual data report was financed by the National Park Service. Continuous recorders were used to monitor water levels in Devils Hole, three observation wells, and the flow from four springs. Also, monthly readings were made on two wells to help define a general trend of groundwater levels. Monthly meter readings of six electrically powered irrigation wells provided a record of power consumption, which in turn is a measure of the amount of water pumped. The purpose of the work is to observe the effects of groundwater withdrawals for irrigation on the level in Devils Hole and the flow from the major springs in the area. The pool in Devils Hole, which is a collapsed fault structure, is the only known native habitat of desert pupfish, Cyprinodon diabolis. (Woodard-USGS)
W76-02958

DOCUMENTATION OF FINITE-DIFFERENCE MODEL FOR SIMULATION OF THREE-DIMENSIONAL GROUND-WATER FLOW,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-02962

GROUND-WATER LEVELS IN WYOMING, 1974,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 7C.
W76-02964

PREDICTED EFFECTS OF PUMPING ON LOWERING THE WATER TABLE IN THE TWIN, CRYSTAL, RYAN LAKES-HIGHWAY 100 AREA, HENNEPIN COUNTRY, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4C.
W76-02965

EVALUATION OF THE AQUIFER CHARACTERISTICS OF THE BASALTIC TERRAIN OF MAHARASHTRA IN INDIA,
Central Groundwater Board, Nagpur (India).
For primary bibliographic entry see Field 2F.
W76-02970

4C. Effects On Water Of Man's Non-Water Activities

METHODS OF AVALANCHE CONTROL ON WASHINGTON HIGHWAYS, FOURTH ANNUAL REPORT,
Washington Univ., Seattle. Dept. of Geophysics; and Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W76-02546

THE FACTS OF LIFE,
Wisconsin Univ. Center System-Marinette County, Bay Shore. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-02651

BENEFICIAL AND DETRIMENTAL EFFECTS OF RANGE IMPROVEMENT PRACTICES ON RUNOFF AND EROSION,
Utah State Univ., Logan. Coll. of Natural Resources; and Utah State Univ., Logan. Watershed Science Unit.
G. F. Gifford.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 216-248, 10 fig, 8 tab, 82 ref.

Descriptors: *Range management, *Revegetation, *Soil conservation, *Runoff, Erosion, *Water sources, Ranges, Vegetation establishment, Water conservation, Forest management, Conservation, Clear-cutting, Vegetation effects, Surface runoff, Sediment yield, Soil surfaces, Planting management, Contour furrows, Trenches, Reservoir construction, Water spreading.
Identifiers: *Range improvement practices, Pitting, Ripping, Plowing, Chaining, Gully plugs.

Range improvements are generally considered to be special treatments, developments, and structures used to improve range forage resources or to facilitate their use by grazing animals. In many cases only broad generalizations of the beneficial or detrimental effects of range improvement practices are possible since several improvement practic4s are generally used together thus confounding the impact of a single treatment by itself. Subjects discussed include: pitting (the forming of small pits in the soil in order to catch and hold rain and runoff), ripping or subsoiling, plowing, chaining, seeding, contour furrows, contour trenches, gully plugs, small reservoir construction, and water spreading. Range improvement practices are not all beneficial from the standpoint of runoff and sediment production, and in fact, most research has shown that improvement practices which involve severe mechanical disturbance should not be expected to improve hydrologic conditions. Since the life of most mechanical treatments is relatively short, it is imperative that a desirable vegetative cover be established and properly maintained. Where adequate (greater than or equal to 70% cover) vegetation has been established as a result of some improvement scheme, then improvements in hydrologic behavior are also generally noted. (Robinett-Arizona)
W76-02671

MODELING MANAGEMENT OF PONDEROSA PINE FOREST RESOURCES,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
M. B. Baker, Jr.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975 Logan, Utah, p 478-493, 8 fig, 4 tab, 7 ref.

Descriptors: *Pondersa pine trees, *Forest management, *Vegetation effects, *Clear-cutting, *Cost-benefit ratio, Coniferous forests, Conservation, Lumbering, Recreation, Watershed management, Vegetation, Land management, Cutting management, Pinyon pine trees, Pine trees, Juniper trees, Water yield, Soils, Forages, Wildlife, Economics, *Arizona.
Identifiers: *Salt-Verde River Basin(Ariz), *Beaver Creek watershed(Ariz).

Attempts are made to evaluate the effects of vegetation changes in the 275,000-acre Beaver Creek watershed (chosen to represent the pinyon-juniper and ponderosa pine types within the Salt-Verde Basin, Arizona) on water yield, soil, forage, wildlife, and recreation, as well as determining whether these changes alter the risk from such disasters as fire, insects, and disease. Water yield increases of up to 1 to 2 inches per year were noted over a 6-year period as a result of various intensities and patterns of timber basal area reduction. A timber simulation model suggests that harvestable timber volume growth can be increased, even with substantial reductions of timber basal area. Herbage production can increase 500 pounds per acre per year on low to moderately productive soils as the result of complete overstory removal, in addition to the improvement of deer and elk habitat. A benefit-cost ratio of $3.30 was estimated for the option of intensive management of the more productive pine sites (about one-third of the area) for tree growth, the interspersing of wildlife-oriented treatments on about one-third of the area, and severe thinning on the remaining one-third of the pine stands. (Robinett-Arizona)
W76-02672

THE IMPACT OF SUBURBANIZATION ON FLUVIAL GEOMORPHOLOGY,
Iowa Univ., Iowa City. Dept. of Geography.
W. L. Graf.
Water Resources Research, Vol. 11, No. 5, p 690-692, October 1975. 4 fig, 1 tab, 4 ref.

Descriptors: *Geomorphology, *Fluvial sediments, *Urban runoff, *Colorado, Watersheds(Basins), Flood plains, Sediments, Surface runoff, Erosion, Deposition(Sediments), Flood peak, Drainage, Stream erosion, Sediment transport, Drainage patterns(Geologic), Land use, *Suburban areas, *Urbanization.
Identifiers: *Fluvial geomorphology, Suburbanization, *Denver(Colo), Stream length.

Analysis of aerial photography for the period 1950-1971 and field data collected from 1970 to 1974 indicated that in the Denver area suburban development has caused significant changes in fluvial systems. By first introducing large quantities of sediment and later by increasing surface runoff, suburban development leads to an expansion of floodplains followed by downcutting of streams. As areas of suburban development increase, greater percentages of stream lengths are dominated by transportation, and lesser percentages are dominated by erosion and depostion. (Lee-ISWS)
W76-02702

HIGHWAY AND SEWER IMPACTS ON URBAN DEVELOPMENT,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W76-02717

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MULTIPLE USE EFFECTS OF MANIPULATING PINYON-JUNIPER,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W76-02723

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Massachusetts Univ., Amherst. Water Resources Research Center.
D. O. Doehring, M. E. Smith, and J. G. Fabos.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 407, $4.00 in paper copy, $2.25 in microfiche. Water Resources Research Center Publ No 53, June 1975. Completion Report FY-75-6, 29 p, 16 fig, 7 tab, 14 ref. OWRT A-074-MASS(1). 14-31-0001-5021.

Descriptors: *Flood plains, Model studies, *New England, Risks, Flood frequency, *Land use, Mathematical models, Flood forecasting, Regression analysis, *Urbanization.
Identifiers: Flood hazard analysis.

The relation between land use changes and flood expectancies in southeastern New England is examined. The common assumption that urbanization affects only floodplains related to low return period events is also evaluated with respect to this region. Watershed morphometry, surficial character, and land use were considered to be the most important independent variables which could be quantified. Morphometry was taken from U.S. Geological Survey 7 1/2 - minute quadrangles; surficial properties were derived from U.S.G.S. geologic quandranges, Soil Conservation Service soil maps, and supplementary topographic map interpretation; and land use data for 1952 and 1972 were acquired from the Massachusetts Map Down series. The dependent variable, an index of change in flood expectancy, is conceptualized as a response to land use change; morphometry and surficial character of a given basin are conceived as factors which condition the primary response. Mathematical models which were erected by multiple regression techniques are useful for predicting change in flood expectancies and account for more than 97 percent of the total variance. The paramount finding of the research, however, is that the assumption of static floodplains corresponding to high return periods is not justified for this study area. The probable consequence of such an assumption in flood hazard analysis is to underestimate the risk.
W76-02865

CHANGES IN STORM HYDROGRAPHS AFTER ROAD BUILDING AND CLEAR-CUTTING IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. School of Forestry.
R. D. Harr, W. C. Harper, J. T. Krygier, and F. S. Hsieh.
Water Resources Research, Vol 11, No 3, p 436-444, June 1975. 1 fig, 6 tab, 25 ref. OWRT A-001-ORE (20).

Descriptors: *Runoff, *Clear-cutting, *Road construction, *Oregon, Water yield, Peak discharge, Land clearing, Pacific coast region, *Storm runoff, Streamflow, *Hydrographs, Watersheds(Basins).
Identifiers: *Runoff enhancement, Quick flow, Delayed flow.

Changes in storm hydrographs after road building, clear-cutting, and burning were determined for 6 small watersheds in the Oregon Coast Range. Peak flows were increased significantly after road building, but only when roads occupied at least 12% of the watershed. Roads had no detectable effect on volumes of storm hydrographs. By reducing transpiration and interception, partial clear-cutting increased peak flow, quick flow, delayed flow, and total storm hydrograph volume of some streams. Most increases were largest in the fall when maximum differences in soil water content existed between cut and uncut watersheds. Maximum increases in storm flow occurred after a 175-acre watershed was 82% clear-cut. Here peak flow increased 16 cu ft/sq mi, quick flow 1.5 in., and total strom hydrograph volume 2.6 in. during the fall. The average increase in winter peak flows was smaller. The effect of roads on peak flows has significance for design of culverts and bridges in headwater areas, but probably does not influence downstream flooding. Increases in streamflow after clear-cutting should have no appreciable effect on either damage to bridges and culverts in headwater areas or downstream flooding. Caution must be used in extending results of this study to storm runoff events of low frequency and large magnitude. (Jess-ISWS)
W76-02937

ASCE URBAN WATER RESOURCES RESEARCH PROGRAM,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Program.
For primary bibliographic entry see Field 2A.
W76-02939

PREDICTED EFFECTS OF PUMPING ON LOWERING THE WATER TABLE IN THE TWIN, CRYSTAL, RYAN LAKES-HIGHWAY 100 AREA, HENNEPIN COUNTRY, MINNESOTA,
Geological Survey, St. Paul, Minn.
M. S. McBride.
Administrative Report, 1974. 59 p, 15 fig, 2 tab, 11 ref.

Descriptors: *Model studies, *Water levels, *Groundwater, *Road construction, *Submergence, Forecasting, *Minnesota, Data collections, Drawdown, Water table, Baseline studies, Road design.
Identifiers: *Hennepin County(Minn).

A proposed rebuilding of Minnesota Highway 100, in the Minneapolis suburb of Brooklyn Center, would require an underpass whose readbed would be, in part, below the present water table. A digital hydrologic model of the surficial glacial outwash aquifer in the area of the underpass was made to predict:(1) the pumping rate required to keep the water table at a design level 5 ft below the roadbed, (2) the rate of drawdown and recovery, and (3) the effects of the pumping on nearby Twin, Crystal, and Ryan Lakes. The minimum total pumping rate to keep the roadbed dry would be about 2.0 cfs. At this rate, water levels at the underpass would fall to within 1 ft of the required design level within 3 to 6 weeks. If pumping stopped, water levels would rise about 1 ft in the first 10 hours. Under steady-state conditions, Twin and Crystal Lakes would be the sources of 75 percent or more of the water pumped.(Woodard-USGS)
W76-02965

4D. Watershed Protection

A WATERSHED VOLUME RESPONSE MODEL CONSIDERING CONTRIBUTING AREA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-02523

CONVERSION OF CHAPARRAL TO GRASS IN CENTRAL ARIZONA: EFFECTS ON SELECTED IONS IN WATERSHED RUNOFF,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5B.
W76-02527

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 10. VEGETATION OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ., Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W76-02560

INFLUENCE OF LAND DEVELOPMENT AND LAND USE PATTERNS ON WATER QUALITY,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-02637

VEGETATION RESPONSES TO GRAZING, RAINFALL, SITE CONDITION, AND MESQUITE CONTROL ON SEMIDESERT RANGE,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2I.
W76-02663

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona University, Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-02664

STRIP MINING AND RECLAMATION ON THE BLACK MESA OF ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5G.
W76-02670

BENEFICIAL AND DETRIMENTAL EFFECTS OF RANGE IMPROVEMENT PRACTICES ON RUNOFF AND EROSION,
Utah State Univ., Logan. Coll. of Natural Resources; and Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4C.
W76-02671

MODELING MANAGEMENT OF PONDEROSA PINE FOREST RESOURCES,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-02672

ECONOMICS OF SOIL TREATMENTS IN THE UPPER COLORADO,
Utah State Univ., Logan. Dept. of Range Science.
J. P. Workman, and J. E. Keith.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 591-596, 3 tab, 11 ref.

Descriptors: *Colorado River Basin, *Sediment control, *Land management, *Erosion control, *Frail lands, *Arid lands, Colorado River, Desilting, Reservoir silting, Sediment load, Sediment yield, Erosion, Slope protection, Soil conservation, Soil stabilization, Colorado, Arizona, Lakes, Cost-benefit ratio, Economics.
Identifiers: *Lake Powell, Glen Canyon Dam.

The Upper Colorado River basin contains 1,280,000 acres of frail lands characterized by steep slopes, highly erodible soils, extremely sparse vegetation, and an arid climate. Although this area contributes only 5% of the Colorado River water flowing past Lee's Ferry, Arizona, it is responsible for about 44 percent of the sediment

load deposited into Lake Powell. In this report the economic aspects of erosion control practices on the land were studied using a minimum possible costs and maximum possible benefits procedure. Surface treatment of this area promises to yield a benefit-cost ratio of only 0.12 even under unrealistically favorable conditions. The authors conclude that although the Glen Canyon damsite will be lost in about 200 years in the absence of erosion control, surface treatments of frail land soils are not only ineffective from a physical and biological standpoint but are also unsound economically. (Robinett-Arizona)
W76-02674

STATUS MEMORANDUM ON CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02682

TIME SERIES ANALYSIS OF A WATERSHED RESPONSE VARIABLE,
Ottawa University (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-02699

THE IMPACT OF SUBURBANIZATION ON FLUVIAL GEOMORPHOLOGY,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-02702

SEDIMENT TRANSPORT FROM BIG SAGEBRUSH WATERSHEDS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
D. L. Sturges.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 728-738, 3 fig, 3 tab, 4 ref.

Descriptors: *Sediment transport, *Sagebrush, *Suspended solids, *Soil erosion, *Snowmelt, Range management, Sediment load, Erosion, Vegetation effects, Watersheds(Basins), Watershed management, Slope stability, Bed load, Surface runoff, Soil surfaces, Precipitation(Atmospheric), Rainfall, Perennial Streams.
Identifiers: Big Sagebrush watersheds, Over-snow runoff.

Sediment transport was studied in two experimental watersheds with perennial flow located on the Stratton Sagebrush Hydrology Study Area 20 miles west of Saratoga at a 7,800-ft elevation. Sedimentation characteristics of Loco and Sane Creek may not be typical of much of the big sagebrush type as the watersheds have a higher than usual precipitation, a productive vegetative cover reflecting sound land management, and stable soils. During the 7 years of study at the Stratton area, erosion caused by intense summer rains was not important as it is in portions of the big sagebrush type. Suspended sediment concentrations were less than 11 ppm on most days through the winter, rose quickly as snowmelt runoff started in the spring reaching a maximum concentration of almost 300 ppm during maximum flow, then, decreasing rapidly, were usually less than 20 ppm through the summer. Most sediment movement occurred during snowmelt runoff when flows and suspended sediment concentrations were high. In years with over-snow runoff, sediment movement was elevated. (Robinett-Arizona)
W76-02725

EFFECTS OF SURFACE CONFIGURATION IN WATER POLLUTION CONTROL ON SEMIARID SURFACE MINED LANDS,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
For primary bibliographic entry see Field 5G.
W76-02726

STAGES OF DEVELOPMENT OF GULLIES IN THE WEST,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W76-02727

WATERSHED INDICATORS OF LANDFORM DEVELOPMENT,
Arizona State Univ., Tempe.
B. H. Heede.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 43-46, 4 ref.

Descriptors: *Watershed management, *Geomorphology, *Streams, *Land forming, *Streamflow, Topography, Equilibrium, Sedimentation, Erosion.
Identifiers: Dynamic equilibrium.

Traditionally, watershed management is concerned with water and sediment yield, vegetation, soils, and meteorology, but not with geomorphology. Often it is in this field that the explanation can be found for the formation and present condition of a watershed and its future development. Examples are presented to demonstrate that factors in the hydraulic geometry of streams indicate whether a watershed is in an active stage of landform development, or is in dynamic equilibrium. Some general guides for the practitioner are provided. Watershed management research cannot afford to ignore the basic geomorphic setting of watersheds. If geomorphology is not considered, the researcher's results could be misinterpreted. (McLachlan-Arizona)
W76-02739

THUNDERSTORM PRECIPITATION EFFECTS ON THE RAINFALL-EROSION INDEX OF THE UNIVERSAL SOIL LOSS EQUATION,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W76-02740

VARIABILITY OF INFILTRATION CHARACTERISTICS AND WATER YIELD OF A SEMI ARID CATCHMENT,
Arizona Univ. Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2G.
W76-02742

REMOTE SENSING APPLICATIONS TO HYDROLOGY IN MINNESOTA,
Minnesota Univ., Minneapolis, Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-02907

CALCULATING SNOW COVER DENSITY IN THE KYZYLCHA MOUNTAIN RIVER BASIN,
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 2C.
W76-02912

FIRST RESULTS OF INVESTIGATIONS OF THE WATER BALANCE IN RIVERS IN THE UPPER KOLYMA BASIN,
For primary bibliographic entry see Field 2E.
W76-02926

PECULIARITIES OF FORMATION OF RUNOFF OF THE UPPER KOLYMA BASIN,
For primary bibliographic entry see Field 2C.
W76-02927

REPORT ON INVESTIGATION OF WATER QUALITY OF CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02931

SEDIMENT YIELD OF SELECTED WATERSHEDS WEST OF THE GREAT PLAINS,
Arizona Univ., Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 2J.
W76-02971

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

DETERMINATION OF NITRATE IN WATER SAMPLES USING A PORTABLE POLAROGRAPHIC INSTRUMENT,
South Carolina Univ., Columbia.
R. L. Young, J. E. Spell, H. M. Siu, R. H. Philp, and E. R. Jones.
Environmental Science and Technology, Vol 9, No 12, p 1075-1077, November, 1975. 3 fig, 8 ref, 1 tab.

Descriptors: *Water analysis, *Nitrates, *Polarographic analysis, Analytical techniques, Water pollution sources, Pollutant identification, Inorganic compounds, Nitrogen compounds, Equipment, Natural streams, Water quality, Water properties, Instrumentation.

A simple portable polarographic analyzer is described. The determination of nitrate in natural water samples from the polarographic waves developed in the presence of Zr(IV) and U(VI) is reported. These catalytic systems allow direct compensation of background currents due to interferences. Results for both methods are in good agreement with those from spectrophotometric analyses, provided analyses are done at the same time. (Witt-IPC)
W76-02506

DETERMINATION OF TRACE ORGANICS IN MUNICIPAL SEWAGE EFFLUENTS AND NATURAL WATERS BY HIGH-RESOLUTION ION-EXCHANGE CHROMATOGRAPHY,
Oak Ridge National Lab., Tenn.
W. W. Pitt, Jr., R. L. Jolley, and C. D. Scott.
Environmental Science and Technology, Vol 9, No 12, p 1068-1073, November, 1975. 4 fig, 13 ref, 3 tab.

Descriptors: *Pollutant identification, *Water analysis, *Organic compounds, Chromatography, Ion exchange, Separation techniques, Analytical techniques, Water pollution sources, Water properties, Water chemistry, Natural streams, Water quality, Ultraviolet radiation, Municipal wastes, Effluents, Phenols, Carbohydrates, Amino acids, Organic acids.
Identifiers: Alkaloids.

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Automated, high-resolution ion-exchange chromatographs, previously developed for the analysis of the molecular biochemical constituents in human body fluids, have been applied to the analysis of various polluted waters. Samples of polluted waters have been collected from selected sources, concentrated up to 10,000-fold, and chromatographed on high-pressure ion-exchange columns. Monitoring of the column eluates for ultraviolet absorbance and cerate oxidizability has revealed the presence of numerous organic contaminants, many of which have been subsequently identified by auxiliary techniques such as mass spectrometry. In the primary and secondary effluents from a domestic sewage treatment plant, 56 and 13 organics, respectively, have been identified. A total of 16 different organic compounds have been identified in five different natural waters. All identified pollutants are listed. They include carboxylic and amino acids, phenols, sugars (glucose, galactose), sugar alcohols, alkaloids, and miscellaneous types of organic compounds. (Witt-IPC)
W76-02507

APPLICATION OF ENERGY-DISPERSIVE X-RAY FLUORESCENCE TO TRACE METAL ANALYSIS OF NATURAL WATERS,
California Univ., Davis. Crocker Nuclear Lab.
J. F. Elder, S. K. Perry, and F. P. Brady.
Environmental Science and Technology, Vol 9, No 12, p 1039-1042, November, 1975. 3 fig, 20 ref, 3 tab.

Descriptors: *Water analysis, *Trace elements, *Metals, X-ray fluorescence, Analytical techniques, Water pollution sources, Pollutant identification, Inorganic compounds, Equipment, Costs, Water properties, Water chemistry, Natural streams, Water quality, Dissolved solids, Lakes, Cations.
Identifiers: Lake Tahoe(California).

Energy-dispersive x-ray fluorescence is a relatively recent development in the field of x-ray spectrometry which improved capability for rapid multielement analysis. Application of the technique to analysis of dissolved trace metals in water requires transfer of the dissolved elements to a uniform target suitable for analysis. This can be accomplished by precipitating the elements with the nonspecific chelating agent, ammonium-l-pyrrolidine dithiocarbamate, and filtering through a membrane filter. The method is applicable to many types of aqueous samples and for analysis of most transition metals. Equipment and costs, as well as advantages and limitations of the method are discussed. Data from analysis of waters in the Lake Tahoe basin are presented and discussed. (Witt-IPC)
W76-02510

COMPARATIVE ATOMIC ABSORPTION SPECTROSCOPIC STUDY OF TRACE METALS IN LAKE WATER,
Limnetics, Inc., Milwaukee, Wis.
T. Surles, J. R. Tuschall, Jr., and T. T. Collins.
Environmental Science and Technology, Vol 9, No 12, p 1073-1075, November, 1975. 10 ref, 3 tab.

Descriptors: *Water analysis, *Trace elements, *Metals, *Spectroscopy, Analytical techniques, Water pollution sources, Pollutant identification, Inorganic compounds, Water properties, Water chemistry, Natural streams, Water quality, Lakes, Copper, Chromium, Cadmium, Manganese, Lead, Nickel, Zinc, Cations.
Identifiers: Atomic absorption spectra.

Two methods of atomic absorption spectroscopic analysis of lake water were used in this study: (1) flameless atmomization, using a Massmann-type graphite furnace, and (2) flame atomization preceded by a chelation/solvent extraction concentration procedure. Analyses were performed for Cu, Cr, Cd, Mn, Pb, Ni, and Zn. The sensitivities and detection limits for many metals using a graphite furnace are known to be better than those using any flame methods. Results from this study indicate that, by using proper procedures, accuracy and precision of flameless atomization methods are equal to those for chelation/solvent extraction flame methods. (Witt-IPC)
W76-02511

MEASUREMENT AND ANALYSIS OF TEMPORAL VARIATIONS OF SALINITY IN SHALLOW WATER,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-02542

BACKGROUND INFORMATION FOR PROPOSED NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS, PETROLEUM REFINERIES, STORAGE VESSELS, SECONDARY LEAD SMELTERS AND REFINERIES, BRASS OR BRONZE INGOT PRODUCTION PLANTS, IRON AND STEEL PLANTS, SEWAGE TREATMENT PLANTS: VOLUME 2, APPENDIX: SUMMARIES OF TEST DATA.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs; and Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
For primary bibliographic entry see Field 5G.
W76-02543

EVALUATION OF AN INFRARED OIL FILM MONITOR,
Wright and Wright, Inc., Newton Center, Mass.
D. E. Wright, and J. A. Wright.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-004 912, $5.50 in paper copy, $2.25 in microfiche. Report No. CG-D-51-75, September 1974. 111 p, 55 fig, 1 append. DOT-CG-33672-A.

Descriptors: *Monitoring, *Oil, *Infrared radiation, *Reflectance, *Evaluation, *Pollutant identification, On-site investigations, Measurement, Value engineering, Water analysis, Oil pollution, Oil wastes, Oil spills, Oily water, Analytical techniques, Physical properties, Refractivity, Instrumentation, Water pollution, Oil-water interfaces, Laboratory tests, Films, Pollutants, Remote sensing, Environmental effects.
Identifiers: *Oil film detector, *Infrared reflectance, *Oil pollution monitoring, *Infrared oil film monitor, *Oil slick detector, Oil discharges, Oil films.

An evaluation program was undertaken on a remote oil film detection instrument which utilizes the infrared reflectance of water surfaces. Oil slick detection is based on a change in the normal water reflectance ratio of two wavelengths in the 3 micron spectral region. Laboratory and field tests demonstrated the instrument's ability to reliably detect petroleum films while effectively ignoring non-hydrocarbon pollutants on the water surface. The report detailed test procedures and results as well as theory of operation and functional descriptions of the instrument. (Henley-ISWS)
W76-02544

CHRIS APPENDIXES I-VI. (PRELIMINARY SYSTEMS DEVELOPMENT-CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM-CHRIS)
Little (Arthur D.), Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va 22161 as AD757 473, $9.25 in paper copy, $2.25 in microfiche. Report No 73096-1F, May 1972. 273 p, 13 fig, 4 tab, 16 ref. DOT-CG-03, 223-A.

Descriptors: *Publications, *Water pollution, *Hazards, *Chemicals, *Management, Planning, Chemical properties, Organization, Oil spills, Boiling, Dispersion, Evaporation, Safety, Thermal radiation, Disasters, Ventilation Environmental effects, Equipment.
Identifiers: *Chemical spills, Response methods, Contingency plans.

Report contained a collection of appendixes for the Final Report on the Preliminaras PB-236 615 Development of a Chemical Hazards Response Information System (CHRIS). CHRIS is composed of five manuals. The preliminary design, description of, and preliminary specifications for the manuals are contained in: (1) Appendix I, CHRIS Manual Number 1, A Condensed Guide to Chemical Hazards; (2) Appendix II, CHRIS Manual Number 2, Hazardous Chemical Data; (3) Appendix III, CHRIS Manual Number 3, Regional Contingency Plan Data Base; (4) Appendix IV, CHRIS Manual Number 4, Hazard Assessment Handbook; and (5) Appendix V, CHRIS Manual Number 5, Response Methods Handbook. The manual were designed to meet the needs of personnel who respond to emergencies involving the accidental release of hazardous chemicals into water. Appendix VI contained a description and recommendations for the organization required to support and maintain CHRIS. A staff consisting of both technical specialists and administrative personnel would be required to manage and operate CHRIS prior to and following its deployment. (Humphreys-ISWS)
W76-02552

IMPROVEMENTS IN PHENOLDISULFONIC ACID METHOD FOR DETERMINATION OF NOX,
Pratt and Whitney Aircraft, East Hartford, Conn.
D. J. Robertson, R. H. Groth, and E. G. Glastris.
Environmental Science and Technology, Vol 9, No 10, p 979-981, October 1975. 1 fig, 4 tab, 3 ref.

Descriptors: *Pollutant identification, *Nitrogen compounds, *Analytical techniques, *Chemical analysis, Evaluation, *Methodology, Nitrates, Chemicals, Nitrites, Nitrogen, Analysis, Water analysis, Spectrophotometry, Instrumentation, Testing, Chemistry, Testing procedures, Water chemistry, Sampling, Evaporation, Measurement.
Identifiers: *Phenoldisulfonic acid method, *Improved procedure, *Nitrogen determinations, Borosilicate vessels, Varian model 635D, Chemiluminescence method, Federal Register, Reference method, Gaseous samples.

The phenoldisulfonic acid method prescribed by the Environmental Protection Agency gives erratic results using the procedure outlined in the Federal Register. To remedy this situation, certain variables in the analysis were studied and their effect on the results was determined. By control of these variables, reproducible and accurate analyses can be carried out. Carry out the evaporation step in new unetched borosilicate dishes, discarding any samples with a precipitate and avoiding platinum; add only enough NaOH to neutralize the acidic solution of nitrates; add excess of NH4OH prior to the spectrophotometric measurement; and read the absorbance at 405 nm. Samples of NO in N2 analyzed by the modified phenoldisulfonic acid method and chemiluminescence agreed within 1.5% on average. (Henley-ISWS)
W76-02557

COLORIMETRIC DETERMINATION OF CYANIDE, FLUORIDE AND SULFATE IN WATER,
Kansas State Univ., Manhattan
J. Ramasamy.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 75-16,967. Ph.D. Thesis, 1975, 113 p.

Descriptors: *Analytical techniques, *Pollutant identification, *Sulfates, *Fluorides, Colorimetry, Potable water, Spectrophotometry.
Identifiers: *Cyanides.

Cyanide, fluoride, and sulfate in water were determined colorimetrically, with attention to the appropriate sensitivity, convenience, speed, and specificity. The permissible limit of cyanide in drinking water is 0.01 ppm. The Koenig reaction was employed for the determination CN- by the oxidation of CN- to a cyanogen halide, CNX, in which CN+ was the reactive species. Because fluoride concentration of 1.0 ppm results in a decrease of about 50% in the number of tooth cavities occuring in persons having used fluoridated water all their lives, this is an important substance to measure. The colorimetric reagent used in this study was an inverse complex Be40R6, which can be visualized as neutral beryllium complex with oxygen, a Lewis base, being at the center of the complex instead of an acidic metal ion. Fluoride could be detected in the concentration range of 1.0 to 10 ppm. For the determination of sulfate, the ion was determined by displacement of violurate anion from barium violurate at a pH of 6.0 to 6.2 and spectrophotometric measurement of the violurate anion at 520 nm. Relatively high concentrations of sulfate are found in natural waters and extreme sensitivity in the method of detection is not required. Sulfate may be detected in the range of 30 to 900 ppm. (Kramer-FIRL)
W76-02568

HEAVY METALS IN WATERS AND SOIL ASSOCIATED WITH SEVERAL PENNSYLVANIA LANDFILLS,
Pennsylvania State Univ., University Park.
D. L. Suarez.
Available from University Microfilms Inc., Ann Arbor, Mich. 48106. Order No 75-19,822. Ph.D. Thesis, 174. 234 p.

Descriptors: *Heavy metals, *Pollutant identification, *Water quality, *Landfills, Coals, Shales, Carbonate, Isotherms, Anaerobic conditions, Leachate, Groundwater, Surface waters, Soil analysis, *Pennsylvania.
Identifiers: Todorokite, Geothite, Siderite.

Associated surface and subsurface water quality were examined for four Pennsylvania landfills in different hydrogeological settings. Two sites were in abandoned anthracite and bituminous coal strip mines; one was on shale, and the other was on a carbonate terrain. Concentrations of Fe, Mn, Cu, Zn, Ag, Pb, Cd, Cr, and Hg in water were greater than the maximum allowed. The anaerobic character and complexing properties of leach waters from solid wastes stripped large amounts of Fe and Mn and other associated trace metals from soils near the deposit sites. To characterize heavy metal associations with the Fe and Mn oxides, three sequential leaching steps were performed on the soils. Heavy metals in these soils occurred chiefly in Mn oxide coatings on quartz grains. Todorokite and geothite were the crystalline secondary oxide phases. The molar sorption capacity of the soil Fe oxides may be at least an order of magnitude lower than that of the soil Mn oxides. (Pinto-FIRL)
W76-02569

AQUEOUS COMPLEXATION OF COPPER WITH SEWAGE AND NATURALLY OCCURRING ORGANICS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5D.
W76-02570

DETERMINATION OF TOTAL PHOSPHORUS IN SUSPENDED MATTER OF NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii
S. V. Lyutsarev, and S. D. Mirkina.
Okeanologiya, Vol 14, No 6, p 1107-1109. (Engl. summ)

Descriptors: *Phosphorus, *Oxidation, *Analytical techniques, Zooplankton, Plankton, *Suspended solids, Measurement, *Organic matter, Pollutant identification.

A simple method is describing for oxidizing organic matter of a sample (zooplankton) with KNO3 and KHSO4. The method requires no special equipment, few reagents or special laboratory conditions. The preparatory operation becomes approximately 3 times shorter due to this method. The accuracy of the method is 5% at a P concentration of about 3 migrograms.--Copyright 1975, Biological Abstracts, Inc.
W76-02572

OIL SPILL DETECTOR.
Chemical Engineering, Vol 82, No 22, Deskbook Issue, p 159, October 6, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Oil spills, Monitoring, Pollutant identification, Equipment.

A recent Environmental Protection Agency ruling requires all industries, not just the petroleum industry, to prepare and implement a spill prevention and cleanup plan. An oil detection device is described that will allow a plan to be developed at a reasonable cost. The oil spill detectors are floated in streams, outfalls, and swamps, or placed in the ground where spills are probable. If oil is present, a membrane conveys the oil to a calibrated sensor which then actuates an alarm. Alarm units are available which can monitor up to 20 locations, with output relay circuitry capable of automatically controlling different process functions. (Orr-FIRL)
W76-02581

OSCILLATOR CIRCUIT FOR PROVIDING A CONDUCTIVITY RATIO OF SEA WATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 7B.
W76-02594

WATER QUALITY DETERMINATION APPARATUS,
Kabushiki Kaisha Meidensha, Tokyo (Japan). (Assignee).
N. Furuya, E. Fujimoto, K. Amano, T. Tsukamoto, and N. Sato.
U.S. Patent No 3,913,384, 13 p, 38 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1198, October 21, 1975.

Descriptors: *Patents, *Water quality, *Water properties, *Water pollution control, *Water quality control, Turbidity, Oxidation-reduction potential, Oxygen, Turbulent flow, Electrochemistry, Chemical properties.
Identifiers: Sensors.

An apparatus is described for examining water quality, particularly a water quality determination apparatus in which the sensor element is placed in contact with the water under investigation to electrochemically determine indices representing water quality such as the amount of dissolved oxygen, concentration of hydrogen ions, oxidation-reduction potential and concentrations of various ions as well as such apparatus for optically detecting the turbidity or concentration of suspended matter. The apparatus is provided with means for moving that portion of the water under investigation which is brought into contact with the sensor section to generate a turbulent flow. The housing of the sensing device surrounding the sensor section is constricted in inner diameter in the portion adjacent the sensor section so as to increase the velocity of the test water flowing in the vicinity of the sensor to aid in the generation of the turbulent flow. The sensor section may be provided with means for applying pressure waves to the sensor to remove contaminants. (Sinha-OEIS)
W76-02596

LOWER SHEYENNE RIVER BASIN WATER - LAND - PEOPLE.
North Dakota Water Resources Research Inst, Fargo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 068, $5.50 in paper copy, $2.25 in microfiche. Completion Report, No WI-222-0005-75, September, 1974. 106 p, 13 fig, 2 diag, 30 tab. OWRT B-029-NDAK(1). 14-31-0001-4116.

Descriptors: *Land use, *Mapping, *Water quality, Chemical analysis, Population, Flow rates, Economics, Social values, Computer models, *North Dakota, Hydrogeology, Great Plains.
Identifiers: *Sheyenne River Basin(ND).

Rivers in the Northern Great Plains are carrying increasing pollutant concentrations as the density of human and livestock populations and intensity of land cultivation increase. The major emphasis of this multi-disciplinary project is to quantitatively determine the relationships among land, people, and water quality; and to evaluate the impact of alternative means to increase water quality. Activities during the first year of the project included: (1) mapping of the land use of the complete basin; (2) mapping the surface geology of the upper portion of the basin; (3) periodic testing of the river water for 22 quality indicators; (4) mapping of population densities; (5) description of socioeconomic characteristics of the basin; and (6) statistical analysis of the relationship among the water quality indicators and basin descriptors. Water quality indicators frequently exceeded established pollution standards. The variation in water quality was related to flow rates, temperature, density of human and livestock populations, and the intensity of land cultivation.
W76-02627

THE MICRODETERMINATION OF MERCURY SPECIES IN NATURAL WATER SYSTEMS BY LIQUID CHROMATOGRAPHY,
North Dakota Univ., Grand Forks. Dept. of Chemistry.
R. J. Baltisberger.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 079, $4.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report, No WI-222-010-75, January 1975. 54 p, 5 fig, 7 tab, 5 ref, 2 append. OWRT B-020-NDAK(2). 14-31-0001-3922.

Descriptors: Water chemistry, *Analytical techniques, Chemical analysis, *Chromatography, *Mercury, Water quality standards, *Pollutant identification, Ion exchange, Spectrophotometry, Cations.
Identifiers: *Mercury compounds, Liquid chromatography.

Mercury in environmental water samples can exist in several cationic forms such as Hg(2+), Hg2(2+) and CH3Hg(+). Methylmercury cation, CH3Hg(+) is formed by the methylation of Hg(2+) by aquatic microorganisms. Metalic mercury has a solubility of 0.0000003 moles/liter (60 ppb) at 25 deg and is an equilibrium with Hg(2+). This study has shown that this equilibrium is slow to be established. The fate and form of mercury compounds in aqueous solution involves complex interactions. In order to adequately establish water quality standards for this element, it is desirable to have analytical techniques capable of differentiation of the exact cationic forms of mercury in environmental water samples. Two analytical techniques were developed and tested for (1) the measurements and differentiation of inorganic and organic mercury cations in environmental samples and (2) the separation by ion exchange chromatographic means of these cation and their ultimate analysis by flameless atomic spectrophotometry.

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The first method is useful in the concentration range from 0.1 to 10 ppb Hg2(2+), Hg(2+) or CH3Hg(+). The latter method is useful from 1 to 10 ppb mercury.
W76-02630

INTERACTIONS OF METALS AND SIMPLE OXYANIONS IN WATER,
North Dakota State Univ., Fargo. Dept. of Chemistry.
T. Knoeck.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 077, $3.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report No WI-222-009-75, April 1975. 16 p, 2 fig, 5 tab, 17 ref. OWRT B-016-NDAK(1). 14-31-0001-3627.

Descriptors: *Spectroscopy, Chemical analysis, Aqueous solutions, Model studies, Metals, Ammonium, Potassium, Salts, Anions, Correlation analysis, *Pollutant identification.
Identifiers: Vibrational spectroscopy, Infrared spectroscopy, Raman spectroscopy, Dithiocarbamates, Oxyanions.

The infrared and Raman spectra of ammonium and potassium salts of dithiocarbamate and dithiocarbamate-d2 anions have been obtained and the 9 in plane and 3 out of plane fundamental vibrational frequencies have been assigned for the anions in the C2y point group. A single least squares converged Urey-Bradley force field was developed for both isotopic species and was compared to force fields for metal complexed dithiocarbamates. Although 23 vibrational fundamentals were assigned a single unique set of 14 Urey-Bradley type force constants could not be found. This observation was attributed to a high degree of correlation in certain combinations of force constants. A matrix was generated from the least squares Jacobian matrix and the former matrix showed that the five force constants K(CS), H(SCS), H(SCN), F(SS), and F(SN) were so highly correlated that any number of combinations of numerical values could be used for these force constants without raising the standard deviation of the entire observed-calculated frequency fit above 1.0 percent. The correlation matrix as a test for a unique force field is discussed and an alternate force field with repulsive force constants fixed at Lennard Jones potential values is presented.
W76-02633

UPPER YELLOWSTONE RIVER WATER QUALITY: AUGUST 1973 - AUGUST 1974,
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
For primary bibliographic entry see Field 5B.
W76-02638

WATER RESOURCES DATA FOR NEBRASKA, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 7C.
W76-02656

STUDY OF CORROSION PRODUCTS IN THE SEATTLE WATER DEPARTMENT TOLT DISTRIBUTION SYSTEM,
National Environmental Research Center, Gig Harbor, Wash. Northwest Water Supply Research Lab.
L. A. Dangel.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-036, May 1975. 21 p, 10 tab, 8 ref, append. 1CB047; ROAP 21AQF; Task 04.

Descriptors: *Potable water, *Pollutant identification, *Corrosion, Washington, Distribution systems, Water supply, *Metals, Trace elements.
Identifiers: *Seattle(Wash), Flameless atomic absorption.

Samples from the Seattle Water Department's Tolt distribution system were analyzed for chemical and bacteriological parameters. Changes from the raw water quality were observed, particularly in trace metal concentrations and other parameters related to corrosion. Distribution mains were adequately protected from corrosion by cement and bituminous linings whereas service lines and household plumbing were actively corroded. Metals in the microgram per liter concentration range were determined by a flameless atomic absorption technique. (EPA)
W76-02660

SEVERAL CONTRIBUTIONS TO THE EVALUATION OF THE DISSOLVED CARBON DIOXIDE CONTENT OF DANUBE WATER, (IN GERMAN),
For primary bibliographic entry see Field 5B.
W76-02661

ECOLOGICAL RAMIFICATIONS OF SILVER IODIDE NUCLEATING AGENT ACCUMULATION IN A SEMI-ARID GRASSLANDS ENVIRONMENT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 3B.
W76-02665

STATUS MEMORANDUM ON CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02682

STUDY OF RIVER POLLUTION CAUSED BY MICROPOLLUTANTS,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5B.
W76-02692

RESULTS OF SEA SURFACE MAPPING IN THE PERU UPWELLING SYSTEM,
San Francisco State Univ., Calif. School of Natural Sciences.
J. C. Kelley, T. E. Whitledge, and R. C. Dugdale.
Limnology and Oceanography, Vol 20, No 5, p 784-794, September 1975. 11 fig, 2 tab, 15 ref. NSF GB-35880X, ONR N-00014-67-A-0103-0014.

Descriptors: *Mapping, *Oceanography, *Coasts, *South America, Temperature, Salinity, Nitrates, Silicates, Phosphates, Fluorescence, Upwelling, Bathymetry, Chlorophyll, Ecology, Ecosystems, On-site investigations, Oceans, Measurement.
Identifiers: *Coastal upwelling, *Peru, Ocean ecology, Capes.

Sea surface maps of temperature, salinity, nitrate, silicate, phosphate, and fluorescence were produced almost daily during a 6-week cruise (PISCO) in the Peru upwelling system in the austral fall, 1969. The maps were produced by a shipboard computer from data gathered with the ship underway. The maps show persistent 'plumes' of freshly upwelled water associated with coastal irregularities and prominent bathymetric features. The information on the location, orientation, and extent of these plumes was used to locate stations where primary productivity experiments were carried out. The definition of persistent plumes has led to the development of successful two-dimensional simulation models of the ecosystem. (Lee-ISWS)
W76-02698

RAIN SCAVENGING OF SO2 AND SULFATE FROM POWER PLANT PLUMES,
Battelle-Pacific Northwest Labs., Richland, Wash. Atmospheric Sciences Dept.
M. T. Dana, J. M. Hales, and M. A. Wolf.
Journal of Geophysical Research, Vol 80, No 30, p 4119-4129, October 20, 1975. 6 fig, 6 tab, 18 ref.

Descriptors: *Powerplants, *Sulfur compounds, *Sulfates, *Rain, Effluents, Air pollution, Pollutants, *Path of pollutants, Raindrops, Rainfall, Washouts, Model studies, On-site investigations, Computer models, Precipitation(Atmospheric), Meteorology.
Identifiers: *Sulfur dioxide, *Scavenging, Plumes.

A model has been developed for prediction of the reversible washout of SO2 emitted from power plant plumes and other sources. Predictions of this computer code model compare favorably with washout measurements made during a number of controlled source experiments and four power plant experiments. An application of the model to previous experimental conditions of high background rain acidity showed that 'negative washout' can occur as a result of desorption of SO2 from the rain below the SO2 plume. Scavenging rates (cross-plume integrated fluxes) measured during the power plant study show that the rate of deposition of sulfate was 1-5 times greater than that of SO2 at distances from 0.4 to 11 km from the stack. The experimental phase (raindrop) oxidation and one considering 'in-plume' oxidation. Either mechanism appeared to be comparible with the observations if the SO2-sulfate reaction half time in each case is of the order of 0.07 h. This result followed from a number of assumptions, including a reasonable washout coefficient for sulfate in the in-plume case and equilibrium SO2 washout in the liquid phase case. (Sims-ISWS)
W76-02712

SIGNIFICANCE OF VITAMINE B12 IN MARINE BIOCENOSES, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
L. N. Propp.
Ekologiya, 5(6), 78-80, 1974.

Descriptors: *Vitamin B, *Analysis, Phytoplankton, Aquatic organisms, Seasonal, Ecology, Pollutant identification.
Identifiers: B-12, *Biocenoses(Marine).

Observations of the species composition and content of phytoplankton, the main link in the food chain in the sea, and the seasonal dynamics of vitamine B12 indicate that a change of dominant species of phytoplankton may be related to a change of content of the vitamin in water and it can have definite ecological significance. A study of the biological cycle of vitamine B12 in the sea will permit an evaluation of its role in the life of aquatic organisms and its sources.--Copyright 1975, Biological Abstracts, Inc.
W76-02719

GROUNDWATER POLLUTION FROM SANITARY LANDFILL LEACHATE, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
M. J. Chun, R. H. F. Young, A. S. Kawatachi, and P. R. Bolduc.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 188, $5.00 in paper copy, $2.25 in microfiche. Technical Report No 87, April 1975. 81 p, 43 fig, 6 tab, 42 ref. A-040-HI (1) OWRT. 14-31-0001-4011.

Descriptors: *Groundwater, *Landfills, *Percolation, *Chemical analysis, *Soil analysis, *Leachates, Soil chemical properties, Tests, *Hawaii, *Domestic wastes, Pollutant identification, *Ion exchange, *Microbial degradation, Path of pollutants.
Identifiers: Leachate analysis, Oahu(Hawaii), Oxisol soils.

A two-year study was conducted to determine the chemical characteristics of leachate derived from domestic refuse typical of that found for Honolulu, Hawaii, and to determine the removal characteristics of select Oahu soils with respect to the substances found in these leachates. Four Oxisol soils (Molokai, Wahiawa, Helemano, and Lahaina), one Mollisol soil (Mamala), and one Marsh soil, were subjected to both saturated and unsaturated flow conditions, using as the percolating liquid, leachate produced by saturating (domestic refuse) with water. The domestic refuse had a composition typical for that of Honolulu, Hawaii. Leachate and percolate samples were analyzed for various chemical constituents including pH, hardness, alkalinity, nutrients, chemical oxygen demand, particulates, and a number of metallic cations and heavy metals. Ion exchange was responsible for altering the concentration of inorganic substances in the percolating liquid, while microbial degradation appeared to be the primary mechanism for removing organic substances. Under the test conditions, and using the leachate produced from typical Honolulu refuse, the soils examined were found to have relatively low exchange capacities, while at the same time, organic removals were not significant. Thus, migration of inorganic and organic substances to the groundwater table is possible, and these results suggest that a cautious approach to landfill site selection should be taken, although soil depth to water table and dilution characteristics of the underlying groundwater must also be considered.
W76-02733

THE DEPENDENCE OF THE COMPLETENESS OF NONFERROUS HEAVY METAL SEDIMENTATION FROM WASTE WATERS ON THE PROPERTIES OF THE FILTRATING FABRIC (ZAVISIMOST' POLNOTY OSAZHENIYA TYAZHELYKH TSVETNYKH METALLOV IZ STOCHNYKH VOD OT SVOYSTV FIL'TROVAL'NOY TKANI),
R. K. Alekseyeva, and A. P. Seligerskaya.
Tsvetnyye Metally, No 6, p 29-31, 1973. 2 fig, 3 ref.

Descriptors: *Filters, *Waste water treatment, *Filtration, *Heavy metals, Electrolysis, Chlorination, Lime, Nickel, Carbonates, Laboratory tests, Analytical techniques.
Identifiers: Filter fabrics.

The influence of the properties of the filtrating fabric on the retention of nickel from electrolysis-generated waste water has been studied in laboratory experiments. Prior to filtration through tissue filters, the waste water was chlorinated at a chlorine expenditure of 0.25 kg/cu m, and subsequently neutralized by means of lime or soda. This process is theoretically suitable for the reduction of the residual nickel content in treated water to 0.15 mg/liter. Increased nickel content in the filtrate as compared to the admitted solution was observed when belting or other cotton fiber fabric was used as filter material. When lavsan was used as filter material, no change in the nickel concentration before or after filtration of the carbonate solution was noted. (Takacs-FIRL)
W76-02791

HOW A CHEMICAL PLANT BEATS POLLUTION.
For primary bibliographic entry see Field 5D.
W76-02798

METHOD FOR DETERMINATION OF ACRYLONITRILE AND ACETONITRILE IN WASTE WATERS (METODA PENTRU DETERMINAREA ACRILONITRILULUI SI ACETONITRILULUI IN APEL REZIDUALE),
T. Stefanescu, and Gh. Ursu
Materiale Plastice, Vol 10, No 6, p 330-334, June, 1973. 4 fig, 5 tab, 10 ref.

Descriptors: Waste water treatment, *Industrial wastes, Chemical wastes, Chemical industry, *Analytical techniques, *Pollutant identification, Measurement, Separation techniques.
Identifiers: *Acrylonitrile, *Acetonitrile.

A method for determining acrylonitrile and acetonitrile in waste water, based on their separation from polluted water by azotropic distillation with methyl alcohol and final determination by dosing the resultant ammonia through alkaline saponification, has been perfected. Acrylonitrile is determined by means of excess glycolic acid and subsequent titration with iodine in the presence of amidol, an indicator. Acetonitrile is determined by deducting from the total nitrile content the acrylonitrile content. The precision of the method is sufficient for determining quantities less than two mg/liter of acrylonitrile and acetonitrile. (Takacs-FIRL)
W76-02810

FORMATION OF METHYL MERCURY BY BACTERIA,
Georgia Univ., Atlanta. Dept. of Food Science.
M. K. Hamdy, and O. R. Noyes.
Applied Microbiology, Vol 30, No 3, p 424-432, September 1975. 5 fig, 3 tab, 39 ref.

Descriptors: *Heavy metals, *Mercury, *Enteric bacteria, *Analytical techniques, *Cultures, Microbiology, Bacteria, Chromatography, Spectrophotometry, *Pollutant identification, Georgia.
Identifiers: *Methyl mercury, *Savannah River(Geo), Atomic absorption spectrophotometry, Thin-layer chromatography, Gas-liquid chromatography, Glucose basal salt broth.

Twenty-three Hg(++)-resistant cultures were isolated from sediment of the Savannah River in Georgia to study the transformation in aquatic environments of inorganic divalent mercury compounds to methyl mercury. Adaptation using serial dilutions and concentration gradient agar plate techniques led to the selection of a highly Hg(++)-resistant strain, enterobacter alrogenes. This culture resisted 1,200 micrograms of HG(++) per ml of medium and produced methyl mercury from HgC12, but was unable to convert Hg(++) to volatile elemental mercury. Slightly more methyl mercury was formed under constant aeration than in the absence of aeration. Production of methyl mercury was cyclic in nature and slighly decreased by DL-homocysteine, but increased by methyl cobalamine. The bacterial production of methyl mercury may be a means of resistance and detoxification against mercurials in which inorganic Hg(++) is converted to organic form and secreted into the environment. Quantitative measurements were done with flameless atomic absorption spectrophotometry, thin-layer chromatography, and gas-liquid chromatography. (Hoyle-Vanderbilt)
W76-02812

WATER SAMPLING DEVICE.
French Patent 2,186,132. Applied April 11, 1973. Issured February 8, 1974. French Patents Abstracts, Vol 5, No 9, p 5, April, 1974.

Descriptors: *Patents, *Sampling, Water supply, Byoys, Equipment, Water pollution, *Pollutant identification.

A water sampling device for the supervision of water supplies is described. The device takes samples of definite intervals of time and detects the presence of impurities. The apparatus has reservoirs and can be used on buoys supported on a support at the bottom of a lake or fixed on stakes or piles. Compared with previous devices, all that is required is a rotating arm for shearing glass capillary tubes at the inlet of the reservoirs. The samples can be preserved indefinitely in the containers in a definite order. Once removed from the magazine their contents cannot be altered in any way and they can be tested by means of various probes to determine the degree of pollution. (Merritt-FIRL)
W76-02818

WATER QUALITY MEASURING APPARATUS.
Belgian Patent 806,020, Applied October 12, 1972, Issued February 1, 1974. Derwent Belgian Patents Report, Vol 5, No 8, p 1, March, 1974.

Descriptors: *Pollutant identification, *Patents, *Instrumentation, *Measurement, *Water quality, Potable water, Swimming pools, Effluents, Oxygen, Electrodes, Flow control, Flow measurements, Pipes, Pipelines.
Identifiers: Platinum, Calomel.

A water quality measuring apparatus is described for drinking water, swimming baths, and process effluent. The oxygen absorbed value of a liquid is automatically measured by the instrument using platinum/calomel electrodes as a composite, one piece probe in an amplified measuring circuit. The probe fits into a pocket through which only a fraction of the flow in a main pipe is diverted. The fraction is regulated by a flow control valve and flowmeter upstream of the pocket which discharges at negligible pressure. The instrument can be easily disconnected from the main pipeline in order to clean or renew the electrode without interfering with flow through the main pipeline. Since the electrode is not subjected to main pipeline flow and pressure conditions, it can be constructed as a cheap, lightweight unit. (Merritt-FIRL)
W76-02826

LIQUID POLLUTION MEASUREMENT.
French Patent 2,177,336, Applied March 19, 1973, Issued November 2, 1973. French Patents Abstracts, Vol 5, No 1, p 3, February 7, 1974.

Descriptors: *Measurement, *Liquid wastes, *Oxygen demand, Oxygen, *Patents, Pollutant identification, Incineration.
Identifiers: *Aluminum oxide, Incinerators.

A method of measuring liquid pollution is described in which the liquid is continuously evaluated in terms of total oxygen demand. A continuously metered flow sampled from the liquid is mixed with a measured proportion of oxygen and the mixture is fed into an incinerator, e.g., a fluidized bed of aluminum oxide powder, at > or = 816 C. The exhaust vapors are condensed, separated, and dried to produce å dry residual gas which is measured for oxygen content in an analyzer preferably calibrated to read T. O. D. values. (Merritt-FIRL)
W76-02857

DETERMINING OIL CONTENT IN WATER.
French Patent 1,278,618, Applied March 2, 1973, Issued November 9, 1973. French Patents Abstracts, Vol 5, No 2, p 3, February 14, 1974.

Descriptors: *Oil, Filters, Color, *Separation technique, *Patents, *Pollutant identification.
Identifiers: *Dielectric constant.

A method for determining oil content in water by concentrating the water sample and measuring the oil content in the concentrate is described. The oil is concentrated by passing a definite amount of water per time through a definite surface of a filter material which absorbs or separates the oil. A photoelectric device is used to determine the color change of the oil absorbing filter material. After the passage of the water, either the degree of color change is used as a measure for the oil content, or the dielectric constant of the oil absorbing filter material is determined. The measurement is used to define the oil content. The water is passed twice through the filter material in opposite flow directions so that the greater part of rust and the solid particles are removed from the filter materi-

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. The filter material consists of a thin strip of olypropylene wool. Simple reliable determina-on of the oil concentration in the water is ef-ected even at oil/water ratios below 1/100,000. Merritt-FIRL)
76-02859

HE DETERMINATION AND IDENTIFICA-ION OF MOLECULAR LEAD POLLUTANTS N THE ATMOSPHERE,
ouisiana State Univ., Baton Rouge, La. Dept. of hemistry.
W. Robinson, L. Rhodes, and D. K. Wolcott.
nalytica Chimica, Acta, Vol 78, p 474-478, 1975, ig, 2 ref.

escriptors: *Heavy metals, *Lead, *Air pollu-on, Louisiana, *Carbon filters, *Analytical chniques, *Pollutant identification.
entifiers: *Baton Rouge(La), Molecular lead, rticulate lead.

n analytical method is presented for the deter-ination and identification of lead, both as par-culate lead and as lead in the free molecular form the atmosphere. 500 cc air samples from the aton Rouge area were put through a graphite disc filter the particulates, then drawn through a car-on bed which absorbed the molecular lead com-ounds. The compounds or particulates absorfbed the filter and carbon were atomized and deter-ined by atomic absorption spectrometry. Lead oncentrations varied significantly throughout the y, with maxima during the peak traffic condi-ons. Weather conditions were found to have a rge effect on the concentration of molecular lead the atmosphere. Sources of molecular lead and effects on health are discussed. (Hoyle-Van-rbilt)
76-02881

MPROVEMENTS IN THE ATOMIC-LUORESCENCE DETERMINATION OF MER-URY BY THE COLD-VAPOUR TECHNIQUE,
andon Southern Instruments Ltd., Camberley ngland).
C. Thompson, and R. G. Godden.
nalyst, Vol 100, p 544-548, August 1975, 2 fig, 6 f.

escriptors: *Fluorometry, *Analytical methods, Mercury, *Heavy metals, Urine, *Pollutant entification.
entifiers: *Atomic-fluorescence, Cold-vapor chnique, Blood.

mprovements have been made to a mercury-iorescene detector system. An improvement in e detection limit of approximately 20 times has en achieved. This improvement results from rious factors: decreasing the cell volume in-eased the sensitivity and decreased the time of easurement; an argon sheath minimized air en-inment and improved the base-line stability; a stricted lamp aperture resulted in a relative crease in the constant background (specular flection) level; and cooling the rear face of the ercury lamp with a stream of argon improved th the sensitivity and the base-line stability and so prevented ozone formation (which absorbs rongly at 253.7 nm) between the lamp and the ercury vapor stream. The 253.7 nm mercury line as used with the maximum spectral band pass of nm. The system was tested on urine and blood mples. (Hoyle-Vanderbilt)
76-02882

RECT SPECTROPOLARIMETRIC DETER-INATION OF MOLYBDENUM (VI) WITH D-(-)-1,2-PROPYLENE DIAMINE- TETRAACETIC CID,
dwestern Univ., Wichita Falls, Tex. Dept. of emistry.
A. Gibbs, and R. J. Palma, Sr.
nalytica Chimica Acta., Vol 76, p 199-203, 1975. ig, 2 tab, 17 ref.

Descriptors: *Heavy metals, *Molybdenum, *Optical properties, *Indicators, Pollutant identification.
Identifiers: *Tungsten, Spectropolarimetric determination, Complexiметric methods.

The optically active and stereospecific compound (D-(-)-1,2-propylenediamine tetraacetic acid (D(-)PDTA) is used as the titrant in this complexiметric method for the determination of molybdenum. The titrant and complexes formed serve as self-indicators, thus permitting the maximum quantitative pH range of the metal complexes to be utilized. pH studies were performed to determine the quantitative pH range for analysis and to establish the maximum differences in rotation between the metal complex and ligand itself. The titration was done at pH 4.80 and the analysis at a wavelength of 365 nm. Mixtures of tungsten (VI) and molybdenum (VI) were titrated in sequence at pH 5.2; however, the molybdenum end point was sharp and reproducible while the tungsten end point was too indistinct. It is therefore possible to determine molybdenum in the presence of tungsten without loss of accuracy. (Hoyle-Vanderbilt)
W76-02883

A CRITICAL STUDY OF THE APPLICATION OF GRAPHITE-FURNACE NON-FLAME ATOMIC ABSORPTION SPECTROMETRY TO THE DETERMINATION OF TRACE BASE METALS IN COMPLEX HEAVY MATRIX SAMPLE SOLUTIONS,
Toronto Univ. (Ontario). Dept. of Geology.
R. B. Crux, and J. C. VanLoon.
Analytica Chimica, Acta, Vol 72, p 231-243, 1974. 8 tab, 15 ref.

Descriptors: *Heavy metals, *Spectroscopy, *Silicates, *Sewage sludge, Cadmium, Cobalt, Copper, Nickel, Lead, Zinc, *Trace elements, *Pollutant identification.
Identifiers: Graphite-furnace, Atomic absorption spectroscopy, Matrices, Blood.

A critical evaluation of the usefulness of non-flame atomic adsorption spectroscopy and its performance in heavy matrix solutions of selected trace heavy metals (cadmium, cobalt, copper, nickel, lead, and zinc) is presented. Studies of physical and chemical interference problems are presented for a range of inorganic and organic matrices: silicate rocks, treated sewage sludge, and blood. Often quoted remedies (e.g. selective volatilization, standard addition) for solution of the more serious problems were found to be of little help in most cases. The influence of variables such as nature and flow rate of purge gas, ashing temperature and atomization temperature are also evaluated. Analyses for the trace metals were done on samples by flame and non-flame methods in high solid solutions. There appeared to be an advantage to the non-flame method in dealing with sample solutions in high organic content, but no advantage is apparent for either technique with highly inorganic matrices. (Hoyle-Vanderbilt)
W76-02885

RADIOCHEMICAL DETERMINATION OF VERY LOW CONCENTRATIONS OF NICKEL IN ROCKS AND MINERALS,
R. A. Zielinski.
Journal of Research, United States Geological Survey Vol 3, No 4, p 467-473, July-August, 1975. 2 fig, 2 tab, 11 ref.

Descriptors: *Heavy metals, *Nickel, *Pollutant identification, *Radiochemical analysis, *Mineralogy, Rocks, Chemistry, Lead, Analytical techniques, Radioisotopes, Irradation, Anion exchange, Chemical precipitation.
Identifiers: Lead bead formation, Beta counting, Fire-assay technique, Detection limits, Neutron irradation, Dimethylglyoxime, Radioactive decay, Beta decay curves, Siderophile elements.

The techniques available for quantitative analysis of nickel in natural materials generally have about 10 micrograms of nickel as a lower limit for accurate determinations. Presented is a radiochemical procedure developed to obtain good accuracy and precision to levels as low as 0.1 micrograms of nickel with sensitivity as low as 0.01 micrograms. Samples are irradiated, combined with nickel carrier, and treated by a series of chemical procedures. The sample is heated until molten, lead is added, and a lead bead forms containing nickel and other siderophile elements. The lead bead is fused again and the basic element hydroxides are precipitated. The sample is put over an anion exchange column equilibrated in 12N HCl. Nickel is not absorbed while all the siderophile elements as well as copper, zinc, and mercury are retained on the column. The nickel dimethylglyoxime precipitate is formed and weighed after filtration to determine chemical yield. The sample is finally counted for beta activity of Ni 65 along with a precipitate from an irradiated nickel standard solution. Results of nickel determinations in standard rocks, rhyolite groundmass, and synthetic standards are given. (Davis-Vanderbilt)
W76-02886

THE DETERMINATION OF TOTAL MERCURY AT THE PART PER BILLION LEVEL IN SOILS, ORES, AND ORGANIC MATERIALS,
Continental Oil Co., Ponca City, Okla. Research and Development Dept.
J. W. Wimberley.
Analytica Chimica Acta, Vol 76, p 337-343, June, 1975. 2 fig, 5 tab, 13 ref.

Descriptors: *Heavy metals, *Mercury, *Analytical techniques, *Pollutant identification, *Spectrophotometry, Gold, Chemical degradation, Degradation(Decomposition), Separation techniques, Soil analysis, Coals.
Identifiers: Amalgamation, Atomic absorption, Induction furnace, Decompsition, Ore analysis, Coal analysis, Organic materials, Gold amalgamation, Mercury trap.

A method is described whereby very low levels of mercury can be determined in both inorganic (soils and ores) and organic samples such as coals. The method is fast (about 8 minutes per sample) and gives satisfactory results in the parts per billion range. Soil and ore samples are ground and sieved through an 80-mesh sieve before analysis. From 1 to 3 grams are placed in a Leco crucible and decomposed in an induction furnace heated to approximately 1000C. Mercury compounds decompose and the vaporized mercury is carried in an oxygen stream through a trap to absorb water and onto a gold coated coil, where it forms an amalgam. After the sample heating has finished, the mercury is vaporized from the coil by passing a current through the coil. The mercury vapor is swept through an optical cell where a change in absorption at 253.7 nm is detected, amplified, and recorded. The recorded peak is directly porportional to the mercury concentrations passing through the cell. (Davis-Vanderbilt)
W76-02887

THE SEPARATION OF RHODIUM AND IRIDIUM BY ANION-EXCHANGE,
Manitoba Univ., Winnepeg. Dept. of Chemistry.
G. A. Kanert, and A. Chow.
Analytica Chimica, Acta, Vol 78, p 375-382, 1975. 2 tab, 17 ref.

Descriptors: *Heavy metals, *Rhodium, *Iridium, *Ion exchange, *Analytical techniques, Anions, Pollutant identification, Separation techniques.
Identifiers: *Anion-exchange resin.

The quantitative separation and recoveries of rhodium and iridium in amounts of 100-1000 micrograms were achieved with a strongly basic anion-exchange resin. The recoveries were 98% or greater over the entire range studied. The

procedure minimizes, by heating the column and acid reservoirs, reduction and hydrolysis reactions on the resin which tend to prevent quantitative elution of the iridium. The rhodium was eluted with 0.8 M hydrochloric acid containing cerium (VI) sulfate. The cerium is washed from the resin and the iridium eluted with concentrated nitric acid at 74C. The ion exchange resin used was Amberlite IRA-400 (16-50 mesh; 8% crosslinging). (Hoyle-Vanderbilt)
W76-02888

THE COLORIMETRIC DETERMINATION OF TITANIUM IN CHROMITES,
British Museum of Natural History, London (England). Dept. of Minerology.
A. J. Easton.
Analytica Chimica, Acta, Vol 78, p 224-226, 1975. 1 fig, 9 ref.

Descriptors: *Heavy metals, *Chromium, *Titanium, *Iron, *Colorimetry, *Analytical techniques, Pollutant identification, Metals.
Identifiers: *Metal-tiron complexes.

The method given for the determination of titanium in the presence of iron and chromium allows the development of the titanium-tiron complex under conditions which reduce interference to a minimum. The quantity of titanium measurable in chromites corresponds to 0.5-2.0 ppm of Ti02 in a solution which would also contain about 100 ppm iron (as Fe20 3) and up to 250 ppm chromium (as Cr20 3). Interference caused by 250 ppm chromium was much less in the pH range 2.0-4.0 than in the range 4.3-9.6. That of 100 ppm iron was almost eliminated by adding ascorbic acid to the aliquot before the tiron. The best wavelength for measuring the titanium-tiron complex is 360 nm (near maximum absorption) where the absorption of the chromium-tiron complex is at a minimum. A pH value of 3.0 + 0.2 is recommended for development of the titanium-tiron complex; however, at this pH the absorption of the chromium-tiron complex increased on standing. As the absorbance of the complex increases rapidly with pH, strict adherence to a pH value 3.0 + 0.2 is necessary. Correction curves can be applied to finally eliminate the interferences entirely. (Hoyle-Vanderbilt)
W76-02889

NEUTRON ACTIVATION ANALYSIS FOR BULK AND TRACE ELEMENTS IN URINE,
Ghent Rijksuniversiteit (Belgium). Instituut voor Nukleaire Wetenschappen.
R. Cornelis, A. Speecke, and J. Hoste.
Analytica Chimica Acta, Vol 78, p 317-327, 1975. 5 tab, 42 ref.

Descriptors: *Heavy metals, *Urine, *Neutron activation analysis, *Bioassay, *Analytical techniques, Electrolytes, Elements, Trace elements, Pollutant identification.
Identifiers: Urine analysis.

Problems in sampling urine for trace and bulk element analysis by neutron activation are systematically examined, and a careful analytical method ensuring reliable results is outlined. Collection, storage, sample preparation and contamination hazards during irradiation are studied in detail. Three different sizes of urine samples are prepared for analysis, depending on the concentration and nuclear properties of the elements, and suitable multielement doped urine standards are used. The samples are immediately frozen in liquid nitrogen and lyophilized upon which they are fit for irradation. As, Br, Ca, Cl, Co, Cr, Cs, Cu, Hg, I, K, Mg, Mn, Na, Rb, Se and Zn are determined. The extreme care given to sample collection, use of 'ultra-clean' vials, and work in a dust-free room, allow consistent values to be obtained. A literature review of the amounts of forty elements present in urine per day is also given (Hoyle-Vanderbilt)
W76-02890

DETECTION OF ZINC IN CHAMPY-MAILLET'S HISTOLOGICAL STAIN BY ELECTRON PROBE ANALYSIS,
Louvain Univ. (Belgium). Departement de Neuropathologie.
J. Gilloteaux, J. Wautier, D. Laduron, and P. DeBethune.
Experientia, Vol 31, Fasc 1, p 10-12, January, 1975. 2 fig, 5 ref.

Descriptors: *Zinc, *Heavy metals, *Cytological studies, *X-ray analysis, *Iodine, Iodides, Biochemistry, Analytical techniques, Chemistry, *Pollutant identification.
Identifiers: *Electron probe analysis, Histology, Staining techniques, Osmium, Cell ultrastructure, Osmium tetroxide, Zinciodide, Histological stains, Champy-Maillet's stain.

The distribution of zinc, osmium, and iodine was investigated in stained zones of histological preparations by means of X-ray electron probe analysis. The purpose was to determine the chemical process which occurs when an osmium tetroxide zinciodide (ZIO) stain is used. Histological sections were prepared with ZIO and scanned for osmium, zinc, and iodine. The technique used allowed separate determinations to be made for each element in the same zone. X-ray intensity profiles show the distribution of osmium and zinc to be ramarkably similar. The iodine levels were too low to be recorded. This indicates that iodine is removed from the preparation, apparently by washings in the histological procedure. Although iodine may be required for the development of the stain, it is the zinc and osmium which remain associated with some cytological structures. It is postulated that complex zinc and osmium cations oxidize double bonds from organic reducing substrates in the cells. (David-Vanderbilt)
W76-02891

BIOGEOCHEMICAL EXPLORATION FOR TUNGSTEN AT BARRYTOWN, NEW ZEALAND,
Massey Univ., Palmerston North (New Zealand).
B. F. Quin, R. R. Brooks, C. R. Boswell, and J. A. C. Painter.
Journal of Geochemical Exploration, Vol 3, No 1, p 43-51, 4 fig, 4 ref, March 1974.

Descriptors: *Geochemistry, *Tungsten, *Heavy metals, *Ferns, *Plant tissues, Soil analysis.
Identifiers: *Biogeochemical exploration, Biogeochemistry, *New Zealand.

Biogeochemical prospecting for tungsten was carried out at a mineralized area near Barrytown, New Zealand. The tungsten content of the ash of leaves of the shallow-rooted tree ferns Cyathea medullaris and Dicksonia squarrosa correlated well with the concentrations of tungsten in the soil. The large tree species did not give significant correlations with tungsten in the soil but could be used to detect tungsten mineralization in bedrock in cases where this could not be achieved by soil sampling along. This detection procedure using trend surface analysis may be useful in delineating extensions of known mineralization. (Hoyle-Vanderbilt)
W76-02893

DETERMINATION OF IRON (III) IN MINERAL SAMPLES BY TITRATION WITH EDTA AND A COATED-WIRE ION-SELECTIVE INDICATOR ELECTRODE,
La Trobe Univ., Bundoora (Australia). Dept. of Inorganic and Analytical Chemistry.
R. W. Cattrall, and Chin-Poh Pui.
Analytica Chimica Acta, Vol 78, 1975. p 463-465, 1 fig, 1 tab, 2 ref.

Descriptors: *Heavy metals, *Iron, *Analytical techniques, Electrodes, *Silicates, Volumetric analysis, *Pollutant identification.
Identifiers: Potentiometric titration, *Ion-selective indicator electrode, Iron pyrites, EDTA.

The use of a coated platinum wire tetrachlorofe rate (III)-selective electrode for the potentiometr titration of iron (III) withe EDTA in solution o tained by the dissolution of certain mineral sa ples is described. Samples of iron pyrites or s icate rock were decomposed in acid to give ir solutions with a total iron concentration of abo 0.01 M and with an adjusted pH 1. The solutio were titrated with a 0.025 M EDTA solution co taining 6 M lithium choloride. The tetrachlorofe rate (III) selective electrode was used to indica the end point. Potentiometric titration with t tetrachloroferrate (III)-selective electrode pr vides a rapid control of the total chloride ion co centration in solution and can be done in strong acidic solutions (pH 1). (Hoyle-Vanderbilt)
W76-02894

SIMPLE TRACE DETERMINATION O PLATINUM IN GEOLOGICAL MATERIALS,
E. L. Kothny.
Journal of Geochemical Exploration, Vol 3, No 1 p 291-299 July 1974. 3 tab, 1 fig, 22 ref.

Descriptors: *Heavy metals, *Trace elements *Analytical techniques, *Spectrophotometry *Platinum, Geochemistry, *Pollutant identifica tion.
Identifiers: *Acid leachates.

A direct, sensitive and simple method for th determination of sub-microgram amounts o platinum in acid leachates from geological materi als is described. Operations involved in thi method eliminate interfering elemets such as C, S Hg, Se, Te, and As, and eventually form precipitated red quaternary complex which i suitable for spectrophotometric determination fo platinum. The sensitivity corresponds to 0.01 microgram per ml of Pt. A test procedure i described for serial analysis of 1-3 g powdered samples which enables an operator to perform from 30 to 50 analyses per man-day in the concentration range of 0.1-17 ppm platinum. The procedure has been validated against standard samples and a recovery of 90% has been obtained with unspiked samples. (Hoyle-Vanderbilt)
W76-02895

A SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF RHENIUM IN GEOLOGIC MATERIALS,
Kennecott Exploration, Inc., Salt Lake City, Utah.
E. J. Mahaffey.
Journal of Geochemical Exploration, Vol 3 No 1, p 53-59, March 1974. 2 tab, 1 fig, 16 ref.

Descriptors: *Heavy metals, *Geochemistry, *Spectrophotometry, *Analytical techniques, Silicates, Brines, *Pollutant identification.
Identifiers: *Rhenium, *Ores.

Existing methods for the chemical determination of rhenium have been modified and adopted for the analysis of rock, sediment, water, brine, and mineral concentrates. The new method can be applied on the determination of rhenium in uranium oxide ore, manganese nodules, plant ash, potash ore, silicate rocks, sulfide concentrates, and water samples. Little restriction is placed on sample size, but usually between 0.1 g and 100 g of solid sample is used which contains between 1 and 200 micrograms of rhenium giving a detection limit of 10 ppb in the sample. Several liters of water may be used giving a detection limit of less than 1 ppb. The spectrophotometric method concentrates and isolates the rhenium from the samples by using carbon adsorption and solvent extraction. (Hoyle-Vanderbilt)
W76-02896

A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH

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ESOURCES TECHNOLOGY SATELLITES, WENTY-FOUR MONTH PROGRESS REPORT.
linnesota Univ., Minneapolis. Space Sciences enter.
or primary bibliographic entry see Field 4A.
/76-02901

VALUATION OF WATER QUALITY BY EMOTE SENSING TECHNIQUES,
linnesota Univ., St. Paul. Dept. of Forest Biolo-
.
. C. Mace, Jr.
: A Study of Minnesota Forests and Lakes sing Data from Earth Resources Technology atellites; Twenty-four Month Progress Report, linnesota University, Minneapolis, Space cience Center, p 19-37, June 30, 1974. 7 fig, 4 tab, ref. NASA NGL 24-005-263.

escriptors: *Remote sensing, *Aerial photog-phy, *Water quality, *Minnesota, Phytoplank-n, Chlorophyll, Secchi disks, Turbidity, utrophication, Evaluation, Photography, Films, ilters, Aquatic plants, Effluents, Sewage ef-uents, Waste water disposal, Nutrients.
lentifiers: *Lake Minnetonka(Minn).

multispectral overflight as scales of 1:3000 and 6000 using 70 mm and 35 mm photography was ade over Lake Minnetonka in late August 1973, evaluate water quality parameters, particularly imary productivity. Analysis of the relationships 2402 Plus-X Aerographic/Wratten 25 film/filter ombination negative film densities to phytoplank-ns, secchi disc depth, and estimated chlorophyll oncentrations indicated a significant correlation. rediction equations were developed for these lationships. Correlations of other film/filter ombinations with these water quality variables ere not successful. Differentiation of some uatic vegetations species by film density mea-rements was possible with all film/filter com-nations. (See also W76-02901) (Sims-ISWS)
76-02903

EMOTE SENSING IN LAKE SUPERIOR STU-ES,
innesota Univ., Duluth. Dept. of Physics.
or primary bibliographic entry see Field 2H.
76-02908

ARIATIONS IN THE NATURAL CHEMICAL ONCENTRATION OF RIVER WATER DUR-G FLOOD FLOWS, AND THE LAG EFFECT: OME FURTHER COMMENTS,
xeter Univ. (England). Dept. of Geography.
E. Walling, and I. D. L. Foster.
urnal of Hydrology, Vol 26, No 3/4, p 237-244, ugust 1975. 3 fig, 2 tab, 7 ref.

escriptors: *Chemical properties, *Correlation alysis, *Flood flow, Flood routing, Flood peak, ow characteristics, Hydrographs, Soil moisture, llutant identification, Streamflow, Storm ru-ff, Hydrology, Specific conductivity, Time lag, ater chemistry, Calcium, Magnesium, Sodium, tassium.
entifiers: *Chemographs, *Devon(Great itain).

sults from several Devon catchments were used demonstrate the complexity of variations in the emical concentration of river water during flood ws. Certain solute species increased rather than creased in concentration during storm events d the 'chemographs' of those species which ex-ibited dilution were often complicated by a ushing effect'. Some solutes exhibited variable sponse, evidencing increased and decreased ncentrations during different events. Even in all catchments, 'chemograph' response can lag hind streamflow response and examples have en documented where the trough precedes the eamflow peak. Values of 'chemograph' lag tween zero and 14.5 hours were found at a gag-ing station on the Devon River. This variation in lag time was tentatively explained in terms of catchment moisture status. A multivariate relationship was developed between 'chemograph' lag and four hydrologic variables: hydrograph rise, preceding flow level, soil moisture deficit, and a seasonal index. (See also W75-00320) (Harmeson-ISWS)
W76-02916

NONPOINT SOURCE MINERAL WATER QUALITY MODEL,
Tennessee Valley Authority, Knoxville. Hydraulic Data Branch.
For primary bibliographic entry see Field 5B.
W76-02922

REPORT ON INVESTIGATION OF WATER QUALITY OF CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02931

GROUND-WATER RESOURCES OF AMERICAN SAMOA WITH EMPHASIS ON THE TAFUNA-LEONE PLAIN, TUTUILA ISLAND,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 4B.
W76-02950

EFFECTS OF ORGANIC SOLUTES ON CHEMICAL REACTIONS OF ALUMINUM,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-02953

SOME LIMNOLOGICAL ASPECTS OF 20 SELECTED LAKES IN EAGAN AND APPLE VALLEY, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 2H.
W76-02966

OIL-SPILL DETECTION SYSTEM,
Texaco Inc., New York. (Assignee).
G. H. Miller, and E. O. Renick, Jr.
U.S. Patent No 3,916,674, 5 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 95, November 4, 1975.

Descriptors: *Patents, *Oil pollution, *OIL spills, *Pollutant identification, Water pollution control, Skimming, Monitoring, Measurement, Equipment.

A system for detecting oil spills on a body of water comprises, in combination, a stainless-steel rotatable disc, and buoyant means for supporting the disc partially submerged in a body of water while it is floating on the surface. The system also has surface-water flow-directing wings attached to the buoyant means for directing movement of surface water to the vicinity of the disc, and means for rotating the disc about its axis. The system also has a doctor blade above the surface of the body of water for removing liquid adherents including any oil floating on the water surface and channel means associated with the blade for directing the adherents into a sediment settling vessel having an outlet which directs the adherents into an upstanding tubular container having electrically insulating interior walls. A pair of electrically conducting plates mounted diametrically opposite one another forms a capacitor with the adherents filling the space between. The system also has air-bubble inlets and outlets on a turbulence chamber for passing bubbles to prevent settling of fine solids. An electrical bridge circuit means include an indicator for indicating the presence of oil in the adherents by measuring the change in capacitance in the capacitor. (Sinha-OEIS)
W76-02996

5B. Sources Of Pollution

EFFECT OF GEOGRAPHICAL VARIATION ON PERFORMANCE OF RECIRCULATING COOLING PONDS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
E. L. Thackston.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/2-74-085, November 1974. 239 p, 138 fig, 92 tab, 13 ref, 4 append. 16130-FDQ. R-800613.

Descriptors: Ponds, Cooling, *Heat transfer, *Recirculated water, *Energy budget, *Thermal pollution, Water temperature, Temperature, Thermal powerplants, Mathematical models, United States, Geographic regions, Meteorology.
Identifiers: *Cooling ponds, Heat transfer coefficient, Equilibrium temperature, Geographic variation.

The energy budget approach to cooling ponds has been outlined and applied to closed cycle, recirculating cooling ponds. Monthly average weather data from 88 stations throughout the U.S. were used to calculate equilibrium temperature, heat exchange coefficients, and the average temperature of various sized ponds receiving the effluent from a standard power plant of 1000-mw capacity, both for average and extreme weather conditions. The data for each station are shown on a separate chart, and the variation of these results across the U.S. is depicted by a series of 38 maps of the U.S., with contours connecting equal values of the parameters. The results may also be used to estimate cooling pond performance for other sized power plants and other sized ponds. The maps disclose variations across the U.S., on a given date, of up to 55F in equilibrium temperature, up to 100% difference in heat exchange coefficients, and up to 50F difference in pond temperatures. Increase of pond temperature over equilibrium is greater in winter than in summer. (EPA)
W76-02501

SESTON AND PERIPHYTON OF THE RIVER VISTULA ON THE SECTOR FROM NOWY BIERUN TO THE WATER STAGE AT LACZANY AND ON THE LACZANY: SKAWINA CANAL (IN POLISH),
Polish Academy of Science, Krakow. Zaklad Ochrony Przyrody.
M. Hanak-Schmager.
Acta Hydrobiol, Vol 16, No 3/4, p 345-364, 1974. Illus.

Descriptors: *Rivers, Europe, *Seston, *Plankton, Zooplankton, Epiphyrology, Tubificids, Aquatic life, Nematodes, *Water pollution sources, *Self-purification, Bacteria, *Microorganisms.
Identifiers: Bacillariophyceae, Chlorophyceae, Chrysophyceae, Ciliata, Cladocera, Copepoda, Cyanophyceae, Flagellata, Heterokontae, Laczany River, Myxomycetes, Nematodes, Nowy-Bierun, Periphyton, *Poland, Pyrrophyta, Rotatoria, Rotifera, Schizomycetes, Skawinacanal, Suctoria, Testacea, Tubificidae, Vistula River, Phyto-seston.

The material for investigation was collected from the River Vistula (Poland) on the sector from Nowy Bierun to the water stage at Laczany, from the Laczany-Skawina Canal, and once from the River Przemsza (Poland) before its confluence with the River Vistula. Samples were collected from July-Oct. 1970. Three communities, phyto-seston, zooplankton and epiphytic associations, were elaborated. Altogether 374 taxons were identified tinguished, of which 41 belonged to Cyanophyceae, 22 to Flagellata, 3 to Pyrrophyta, 6 to Heterokontae, 8 to Chrysophyceae, 162 to Bacillariophyceae, 80 to Chlorophyceae, 14 to Schizomycetes and Myxomycetes, 7 to Ciliata, 1

to Suctoria, 20 to Rotatoria, 8 to Cladocera, 2 to Copepoda; various unidentified Testacea, Nematodes, and Tubificidae were also included. The examined sector of the river was characterized with respect to the pollution level, which was determined on the basis of the list of species and numerical data of the Pantle-Buck index. With the course of the river an increase in the self-purification process was found, this being influenced positively by a high water level (flood waters).--Copyright 1975, Biological Abstracts, Inc.
W76-02513

FOR A MORE COMPLETE UTILIZATION OF SULFITE AND SULFATE SPENT LIQUORS AND PREHYDROLYZATES (POLNEE ISPOL'ZOVAT' SUL'FITNYE, SUL'FATNYE SHCHELOKA I PREDGIDROLIZATY),
Gosudarstvennaya Planovaya Komissiya, Moscow (USSR).
V. I. Kropotov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 4, p 2-4, 1975.

Descriptors: *Sulfite liquors, *Pulp wastes, *Byproducts, Alcohols, Yeasts, Proteins, Water pollution sources, Wastes, Industrial wastes, Water pollution control, Pulp and paper industry, Chemicals, Hydrolysis.
Identifiers: Soviet Union(USSR), Kraft mills, Sulfite pulp mills, Sulfite alcohol, Tall oil, Ethanol(Ethyl alcohol), Hydrolyzates, Wood hydrolysis, Silvichemicals.

Statistical data are presented on the overall production of sulfite alcohol and feed yeast at sulfite mills and of tall oil chemicals at kraft mills for the period 1960-1974. The utilization of spent pulping liquors and wood prehydrolyzates at individual Soviet mills is discussed. Many mills place top little emphasis on the development of the by-product industry. The rate of growth is especially low for the production of sulfite alcohol. It is suggested that the organization by the technical societies and the Ministry of the Pulp and Paper Industry of exchange of information between the mills (through meetings, seminars, etc.) would encourage the mills to better develop their potential for the production of these valuable products and help to meet production goals for the current year and the near future. (Stapinski-IPC)
W76-02516

PREDICTING EFFECTS ON FISH OF FIRE RETARDANTS IN STREAMS,
Forest Service (USDA), Ogden. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 5C.
W76-02519

CLEARCUTTING AND BURNING SLASH ALTER QUALITY OF STREAM WATER IN NORTHERN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-02522

CONVERSION OF CHAPARRAL TO GRASS IN CENTRAL ARIZONA: EFFECTS ON SELECTED IONS IN WATERSHED RUNOFF,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology
D. J. Longstreth, and D. T. Patten.
American Midland Naturalish, Vol 93, No 1, p 25-34, January 1975. 3 fig, 1 tab, 27 ref.

Descriptors: *Watershed management, *Surface runoff, *Nutrient removal, *Nitrates, *Chaparral, Grasses, *Arizona, Nutrients, Chemical analysis, Nitrification, Ions, Ecosystem, Range management, Root systems.
Identifiers: Mazatzal Mountains(Ariz).

Concentrations and temporal patterns of silica, Ca(++), Mg(++), K(+), Na(+), SO4(--), C1(-), NO3(-), total-PO4(--) and ortho-PO4(--) in runoff waters from two watersheds in the Mazatzal Mountains of central Arizona were compared. Water discharge from the watershed converted to perennial grass cover by the U.S. Forest Service was over four times that from the chaparral-dominated watershed. Ionic concentrations were similar with the exception of nitrate concentrations which reached values of over 4mg/liter from the grass-covered watershed, while that from the chaparral watershed was rarely above the limits of detection. This was attributed to the effect of deep-rooted chaparral on the microclimate of the soil. It was concluded that for any hydrological change in a chaparral watershed ecosystem, there is a concomitant change in nutrient cycles, which is seen as important in terms of applicability to management practices. (Mills-Arizona)
W76-02527

CHEMICAL RUN-OFF IN CATCHMENTS CONVERTED TO AGRICULTURAL USE,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Ecology Div.
R. H. S. McColl, E. White, and J. R. Waugh.
New Zealand Journal of Science, Vol 18, No 1, p 67-84, March 1975. 4 fig, 8 tab, 13 ref, append.

Descriptors: *Path of pollutants, *Fertilizers, *Water pollution, *Phosphorus, *Phosphates, *Water quality, Water pollution sources, Agriculture, Chemicals, Fertility, Fertilization, Nitrates, Nitrogen compounds, Phosphorus compounds, Topsoil, Watersheds(Basins), Eutrophication, Nutrients, Pasture management, Pastures, Calcium, Magnesium, Potassium, Lime.
Identifiers: Superphosphate.

The conversion of land to agriculture and the use of fertilizers result in an increase of the nutrient content of run-off waters, and may lead to deterioration of water quality in streams and eutrophication of lakes. This study examines the changes in water quality which took place when an experimental catchment was converted from manuka (Leptospermum scoparium) scrub to pasture, and the quantities of nutrients lost in floods before and after the application of lime and superphosphate fertilizers. Estimated losses of applied fertilizer were as high as 2.8 percent for Ca, 22.9 percent for Mg, and 19.9 percent for K. Phosphorus was the least mobile fertilizer component with losses from the smallest catchment in the first and second post-fertilizer floods of 1.4 and 0.55 percent respectively. In the two larger catchments no losses of soluble phosphorus attributable to fertilizer treatment were found. Removal of P by the stream bed or adsorption on to suspended particulate material seems likely. Although the fertilizer contained no nitrogen, some losses of nitrate and ammonia N seemed due to fertilizer treatment. Large sulfate losses were apparently due to fertilizer treatment, but may have been partly related to solution of exposed rocks high in sulfide. P levels leaving the experimental catchments were less than those found in many natural catchments. In low-fertility areas added P may be almost totally trapped within the system. (Robinett-Arizona)
W76-02528

THE EFFECTS OF CURRENTS AND WAVES ON AN OIL SLICK RETAINED BY A BARRIER,
Texas A and M Research Foundation, College Station.
For primary bibliographic entry see Field 5G.
W76-02549

HEAT DISPOSAL IN WATER ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
D. R. F. Harleman.
Journal of the Hydraulics Division, Ame
Society of Civil Engineers, Vol 101, No
Proceedings Paper 11585, p 1117-1138, Septe
1975. 11 fig, 21 ref, 2 append.

Descriptors: *Hydraulic models, *Thermal p
tion, *Nuclear powerplants, *Thermal strat
tion, *Heat balance, Mathematical mo
Hydraulic jump, Hydraulics, Waste disp
Heated water, Discharge(Water), Waste
disposal, Powerplants, Diffusion, Water tem
ture, Buoyancy, Jets.
Identifiers: *Buoyant jets, *Surface impinge
*Diffusers, Thermal diffusion.

The need for continuing development techniques for predicting temperature dist tions due to waste heat discharges into la rivers, estuaries, and the oceans was prese Diffusion of buoyant jets was examined, inclu heated surface jets and multiple jets issuing fr submerged multiport diffuser. In the near- analysis of surface jets, the important prob were related to the lateral spreading caused buoyancy. Comparison of theoretical predicat with laboratory and field observations were gi The mechanics of multiport diffusers for he discharges in shallow receiving waters were plained in contrast to sewage diffusers. The im tant problem is the degree to which stratifica can be maintained in order to minimize local r trainment and reduction of dilution capa Criteria for stable and unstable flow regimes provided. A mathematical model for tempera distribution, with or without waste heat addit in unsteady flows under time-varying meteorol cal conditions was given. (Lardner-ISWS)
W76-02559

EQUILIBRIUM ADSORPTION OF INORGA PHOSPHATE BY LAKE SEDIMENTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5C.
W76-02562

LARGE SYSTEMS APPROACH TO WAT QUALITY MODELLING AND MANAGEMEN
Texas Univ. at Austin.
B. R. Penumalli.
Available from University Microfilms, Inc., A Arbor, Mich., 48106. Order No 75-16,722. P Thesis, 1975, 234 p.

Descriptors: *Water quality, Analyti techniques, Numerical analysis, Estuaries, Wa resources development, *Model studies, Wa management(Applied), Cost analysis, *Tex Bays.
Identifiers: *Corpus Christi Bay(Tex), Mat model.

A large systems approach to the problem estuarine water quality modelling and manageme is discussed. Analytical techniques of solutions the hydrodynamic and transport equations, whi are fundamental to estuarine water quality mode ing, become intractibel. Numerical techniques a discussed. The problems are mostly highly dime sional and suit themselves well to matrix mode with a simple structure. An error correction a gorithm is developed and used to solve the matr model. The accuracy of the solution is judged b an analytical calibration criterion and an err analysis method. The approaches developed hav been applied to the Corpus Christi Bay on the Gu Coast of Texas. An existing hydrodynamic mod for the area has been modified for the study to ob tain the necessary hydrodynamics for the wate model. Two types of models were used with fiel data. The objective of this study was minimizatio of the total cost of treatment and variables of op timization, and a generalization of standard wate quality. (Pinto-FIRL)
W76-02564

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TRIBUTED PARAMETER SYSTEMS AP-
XIMATION FOR ESTUARINE WATER
ALITY MODELLING AND CONTROL,
as Univ. at Austin.
Olufeagba.
ilable from University Microfilms Inc., Ann
or, Mich. 48106. Order No 75-16,718. Ph.D.
is, 1975, 330 p.

criptors: *Water quality, *Water manage-
(Applied), *Mathematical models, Dissolved
gen, Coliforms, Nitrification, Treatment facili-
Water pollution control, *New York, Path of
tants.
tifiers: *Jamaica Bay(NY).

er quality in an estuary was described by a set
oupled distributed parameter systems. Both
term and short term effects for Jamaica Bay,
York, were investigated. Short term water
ity was described by a system of coupled
d initial boundary value dispersion-advection
ution equations. A method was developed
g a stepwise convergent technique. Results of
ni-linear multi-constituent model for the biota
nitrogen cycle indicated that the biota did not
fy the hypothesis of immotility. For long term
r quality effects, a mixed Dirichlet-Neumann
ic boundary value problem in two spacial
nsions was satisfied, and the effects were
ced to a set of coupled multi-point boundary
e problems for ordinary differential equations.
g term control problems, involving coliform
dissolved oxygen were studied in order to cal-
e optimal management policies for the Jama-
Bay area. An algebraic representation was
loped for the dissolved oxygen concentration
ecific points in the bay as a function of the
ment levels at water pollution control facili-
discharging into the bay. Three management
ies for achieving the DO standard for 1980
proposed, as calculated by defining the op-
nitrification at each of four treatment plants
e Bay. (Kramer-FIRL)
-02565

WTH KINETICS OF HETEROGENEOUS
ROBIAL POPULATIONS AND THE
DELLING OF BIOLOGICAL WASTE
ATMENT REACTORS,
nto Univ. (Ontario).
rimary bibliographic entry see Field 5D.
-02566

MULATION MODEL FOR STUDYING EF-
TS OF POLLUTION AND FRESHWATER
OW ON SECONDARY PRODUCTIVITY IN
COSYSTEM,
h Carolina State Univ., Raleigh.
rimary bibliographic entry see Field 5C.
-02567

VY METALS IN WATERS AND SOIL AS-
IATED WITH SEVERAL PENNSYLVANIA
DFILLS,
sylvania State Univ., University Park.
rimary bibliographic entry see Field 5A.
-02569

ORDSHIRE WASTE SURVEY INTERIM
ULTS.
rimary bibliographic entry see Field 5E.
02589

RACTERISTICS OF THE RADIATION
DITIONS OF DEVELOPMENT OF EGGS
FRESHWATER FISHES BELONGING TO
EENT ECOLOGICAL GROUPS, (IN RUS-
),
sterstvo Zdravookhraneniya SSSR, Moscow.
ut Biofiziki.
rimary bibliographic entry see Field 5C.
02615

THE OXIDATION OF URIC ACID BY IODINE IN AQUEOUS SOLUTION,
North Dakota State Univ., Fargo. Dept. of Chemistry.
F. Rathmann.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 078, $4.00 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo, Report No WI-221-030-75, April, 1975. 29 p, 11 fig, 3 tab, 27 ref. OWRT A-018-NDAK(1). 14-01-0001-1402, 14-01-0001-1854, 14-31-0001-3034.

Descriptors: *Oxidation, *Kinetics, Ions, Chemical reactions, *Chlorination, Model studies, *Iodine, Urine, Acids, Aqueous solutions, Spectrophotometry, Temperature, Hydrogen ion concentration.
Identifiers: *Uric acid.

A kinetic study of the consumption of iodine by uric acid was undertaken to determine reactive intermediates in the oxidation of uric acid. The system was chosen as a practical and closely analogous model for the oxidation in uric acid by chlorinated waters. Rates were followed spectrophotometrically and were measured as a function of pH, temperature and initial concentration. It is concluded that the most important reactive intermediate in the oxidation is the monourate ion.
W76-02632

INFLUENCE OF LAND DEVELOPMENT AND LAND USE PATTERNS ON WATER QUALITY,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
C. D. Gates, and D. A. Haith.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 071, $5.00 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Science Center, (1975). 79 p, 20 tab, 5 fig. OWRT A-062-NY(1). 14-31-0001-5032.

Descriptors: Agricultural runoff, *Agricultural watersheds, Nutrients, Regression analysis, Surface runoff, *Water pollution sources, Nitrogen, Phosphorus, *Water quality, *Land use, *Land development.
Identifiers: Broome County(NY), Cayuga Lake(NY), Nonpoint pollution sources, Susquehanna River, Tioga County(NY).

Field, laboratory and statistical methods were used to study the influence of certain land uses on the waterborne export of certain wastes from a sewered urban area and from unsewered rural watersheds. Comparison, by means of mass balance analysis of the amounts of biodegradable wastes in the Susquehanna River at stations above and below a 20.6 square mile developed area in Broome County, N.Y. indicated that the study area contributed carbonaceous BOD5 at the rate of 390 pounds per day per square mile to the River, averaged over the June-August 1973 and 1974 periods. The nature of the relationship between land use in and plant nutrient outputs from eighteen rural watersheds in the Cayuga Lake Basin was studied through use of regression analysis. The development of regression equations for nitrate and phosphate outputs from individual watersheds did not lead to the development of unambiguous quantitative relationships between land uses and nutrient concentrations. A rational procedure for analyzing nonpoint source pollution, developed from the U.S. Soil Conservation Service semi-empirical runoff equation, was used to estimate non-point source phosphorus and nitrogen inputs from a 578 km2 watershed in Broome and Tioga Counties in New York State. It was concluded that nonpoint sources of nitrogen and phosphorus were not significant in the study area.
W76-02637

UPPER YELLOWSTONE RIVER WATER QUALITY: AUGUST 1973 - AUGUST 1974,
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
R. V. Thurston, R. J. Luedtke, and R. C. Russo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 072, $4.50 in paper copy, $2.25 in microfiche. Research Report No 68, Montana University Joint Water Resources Research Center, Bozeman, August 1975. 57 p, 14 fig, 22 tab, 20 ref, append. OWRT A-081-MONT(1).

Descriptors: *Water quality, *Water pollution sources, *Water chemistry, *Invertebrates, *Montana, Watershed management, Water analysis, Monitoring, Pollutant identification.
Identifiers: *Yellowstone River(Mont).

The Yellowstone River in Montana upstream from the town of Laurel is a relatively non-polluted free-flowing river, used for both recreational and agricultural purposes. Consideration has been given to the feasibility of a storage reservoir above the city of Livingston. Because of the current and possible future uses of this section of the river, a record of water quality is important as baseline data, as well as providing information for watershed management. The water chemistry and macroinvertebrate distribution of the upper Yellowstone River, Montana, were studied between August 1973 and August 1974. Samples were collected at seven stations between Corwin Springs and Laurel on six occasions for macroinvertebrate determinations and on eight occasions for water analyses. No significant water quality degradation was evident from the water chemistry analyses. A small change in the macroinvertebrate species composition was noted along the river course.
W76-02638

SEVERAL CONTRIBUTIONS TO THE EVALUATION OF THE DISSOLVED CARBON DIOXIDE CONTENT OF DANUBE WATER, (IN GERMAN),
E. V. Kozma.
Ann Univ Sci Budap Rolando Eotvos Nominatae Sect Biol. 16: 45-52, Illus. 1974.

Descriptors: *Rivers, *Carbon dioxide, Algae, Phytoplankton, *Chemical analysis, Seasonal, Absorption.
Identifiers: *Danube River, *Hungary.

Between 1965-1971, 420 samples were taken from km 1669 of the Danube river in Hungary. The C ion content varied between 22-69 mg/1; significantly higher that the theoretical 5-6 mg/l. O2 content was highest in winter and lowest in summer. This correlated with the algal population size which ranged from 8-25 million specimens/1 in winter to 1000-1,000,000 specimens/1 in summer. Dissolved CO2 never occurred above pH 8.1 and it did not coincide with dissolved O2. These findings emphasize the importance of the assimilatory activity of phytoplankton.--Copyright 1975, Biological Abstracts, Inc.
W76-02661

STRIP MINING AND RECLAMATION ON THE BLACK MESA OF ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5G.
W76-02670

PHOSPHORUS SORPTION AND DESORPTION IN CALCAREOUS SOILS FROM ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W76-02677

STATUS MEMORANDUM ON CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
Status Report, March 1974. 69 p, 16 fig, 26 photo, 23 tab, 8 ref.

Descriptors: *Water quality, *Runoff, *Surveys, *Minnesota, Water pollution sources, Water pollution, Path of pollutants, Pollutants, Pollutant identification, Watersheds(Basins), Lakes, Surface waters, Domestic animals, Farm wastes, Nutrients, Eutrophication, Aquatic plants, Erosion, On-site investigations.
Identifiers: *Christmas Lake(Minn).

Christmas Lake has a surface area of 260 acres roughly triangular in shape. It is located in both Carver and Hennepin Counties, Minnesota. The watershed is small, with an area including the lake of approximately 410 acres. There are three inflowing tributaries to Christmas Lake, of which Christmas Lake Creek entering from the southwest is most important with regard to flow and nutrient influx. The runoff which has been observed from Twin Hills Farm, County Road 17 and West 62nd Street, indicated that amounts of phosphorus in excess of the effluent standard are being introduced into Christmas Lake. The effect of these nutrients was observed as an extensive population of aquatic macrophytes (i.e., larger plants) in the region of the confluence of those point sources with the lake. This memorandum covered tributary sampling; nutrient contributions from soil erosion and pasture runoff; effects of tributary runoff on lake sediments; macrophyte (rooted aquatic plant) nutrient uptake; and additional biological, chemical, and physical data on the limnology of Christmas Lake. This is a status report and interpretation of data gathered from April 25 through November 21, 1973. (Sims-ISWS)
W76-02682

ANALYSIS OF THREE YEARS OF COMPLETE-FIELD TEMPERATURE DATA FROM DIFFERENT SITES OF HEATED SURFACE DISCHARGES INTO LAKE MICHIGAN,
Argonne National Lab., Ill.
J. M. Kyser, R. A. Paddock, and A. J. Policastro.
Available from the National Technical Information Service, Springfield, Va 22161, as CONF-740820 3, $5.45 in paper copy, $2.25 in microfiche.
For presentation at: IAEA Symposium on Physical and Biological Effects on Environment of Cooling Systems and Thermal Discharges at Nuclear Power Stations, Oslo (Norway), August 26-30, 1974. 55 p, 33 fig, 5 tab, 9 ref. ERDA W-31-109-ENG-38.

Descriptors: *Heated water, *On-site data collections, *Lake Michigan, Illinois, Wisconsin, Indiana, Michigan, Thermal powerplants, Water temperature, Instrumentation, On-site investigations, Measurement, Analysis, Distribution patterns, Dispersion, Discharge(Water), Currents(Water), Lakes, Isotherms, *Thermal pollution.
Identifiers: *Temperature decay, *Thermal plumes, Two Creeks(Wis), South Haven(Mich), Hammond(Ind), Waukegan(ILL).

Temperature data taken from prototype thermal plumes from single (and, in one case, double) surface outfalls under varying environmental conditions were systematically analyzed. Three-dimensional temperature data were taken at four sites on Lake Michigan (Palisades, Point Beach Unit 1, Point Beach Units 1 and 2, Waukegan, and State Line) by an instrument-equipped boat. Of most significance to plume dispersion at these sites were current speed and direction, wind speed and direction, and ambient lake turbulence. Plume characteristics of centerline temperature decay, temperature half-widths, and isotherm areas showed wide variation at a site as environmental conditions changed from one plume to the next. The palisades and Point Beach Unit 1 data each fit into 5 categories distinguished by ranges in current, wind, and lake conditions. The Waukegan site demonstrated the most rapid plume dilution in terms of centerline temperature decay and isotherm areas due to its large outfall densimetric Froude Number (about 9.7). The State Line site with its low initial densimetric Froude Number (about 1) showed the least rapid plume dispersion. The Point Beach Unit 1 and Palisades discharges, although having nearly equal heat-rejection rates and ititial densimetric Froude Numbers (about 2.4), had significantly dif fering plume characteristics due to the large outfall aspect ratio difference and secondarily upon the magnitude of site-dependent ambient currents. The Palisades plumes had a generally slower centerline temperature decay and larger areas than Point Beach due mainly to its much larger aspect ratio. (Humphreys-ISWS)
W76-02683

HORIZONTAL SPREAD OF WASTEWATER FIELD OVER CALM OCEAN SURFACE,
Montgomery Inc., Pasadena, Calif. M. James.
J. L. Chao.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2504-2510, October 1975. 2 fig, 18 ref.

Descriptors: *Theoretical analysis, *Fluid mechanics, *Waste water disposal, Mixing, Equations, Velocity, Dispersion, Effluents, Discharge(Water), Momentum equation, Continuity equation, Jets, *Waste dilution, Oceans, Outlets, *Path of pollutants, Water pollution.
Identifiers: *Ocean outfalls, Radial wall jets, Stream function.

The horizontal spread of the wastewater field, after the effluent from a submerged outfall has reached the ocean surface, was treated as a radial wall jet. The boundary layer approximations were used and a similarity assumption was made to obtain the velocity distribution in the spreading surface layer. The physical dilution which resulted from the horizontal spreading was derived. An example demonstrated that the dilution from horizontal spreading is much less than the initial dilution in the rising bouyant effluent plume. (Adams-ISWS)
W76-02687

REVIEW OF MODELS OF TIDAL WATERS,
Monash Univ., Clayton (Australia), Dept. of Mechanical Engineering.
J. B. Hinwood, and I. G. Wallis.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY11, Proceedings Paper 11693, p 1405-1421, November 1975. 1 ref.

Descriptors: *Model studies, *Reviews, *Water quality, *Estuaries, *Waste water disposal, Dispersion, Environmental engineering, Hydrodynamics, Tidal waters, Numerical analysis, Water pollution, Hydraulics, Mathematical models, Inlets(Waterways), *Path of pollutants, Wastes, Water quality.
Identifiers: *Eulerian models, Waste concentration, Transport models.

Approximatetly 100 models of water and waste movement in tidal bays and estuaries have been reviewed, and their predictive capability and limitation have been examined. The review provided detailed analysis of different models within the same classification. Water quality models predict the concentration of contaminants as a function of time and position in the estuary. Zero-dimensional models are used to predict the concentration field, one-dimensional Eulerian models give an accurate description of waste concentration and movement in a long well-mixed estuary; one-dimensional non-Eulerian models have resulted in the development of transport models; two-dimensional models represent the longitudinal and lateral movement of wastes, transport models based on the vertically integrated conservation of mass equation; and three-dimensional mo allow the complete spatial distribution of the w field to be predicted. By using this review in junction with the classification scheme and selection of questions, the most appropriate m for a particular task may be predicted. (Si ISWS)
W76-02689

WIND EROSION OF HEATED SURFA LAYER,
Delaware Univ., Newark, Coll. of Marine Stud
J. Wu.
Water Research, Vol 9, No 11, p 1005-1
November 1975. 3 fig, 10 ref.

Descriptors: *Wind velocity, *Heated wa *Thermal pollution, *Dispersion, *Entrainm Boundary layers, Condensers, Turbulence, M ing, Heat balance, Temperatu Discharge(Water), Path of pollutants.
Identifiers: *Thermal plume, Ambient tempe ture.

In the once-through cooling system, water at a bient temperature is withdrawn from the natu body of water, pumped through the condense and returned to the water body at higher tempe tures. Thermal pollution problem necessitates derstanding the behavior of heated wa discharge and predicting its dilution by ambi water and heat dissipation into the air. The dilut and dissipation can be roughly divided into: a th mal plume near ejection site, a thermal current near field, and a nearly well-mixed region at field. Intensive entrainment at the interface heated surface layer and ambient water occu because of relative motion and turbulence. Wi stress was shown to introduce significant thicke ing of the heated surface layer due to entrainme at the lower layer boundary. The thickening and the mixing within, the surface layer causes reduction in the surface temprature; the heat lo to the air through conduction may therefore reduce. (Singh-ISWS)
W76-02690

GROUNDWATER POLLUTION CONTROL AN INDUSTRIALIZED PART OF THE TREN BASIN,
Trent River Authority (England).
For primary bibliographic entry see Field 5G.
W76-02691

STUDY OF RIVER POLLUTION CAUSED B MICROPOLLUTANTS,
Research Inst. for Water Resources Development Budapest (Hungary).
P. Literathy.
Water Research, Vol 9, No 11, p 1001-1003 November 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Pollutant identification, *Water pol lution sources, Rivers, *Oil pollution, *Heavy metals, Pollutants, Water quality, Analytica techniques, Chemical analysis, Water pollution, Surface waters, Organic wastes, Oil, *Phenols, Oi wastes, Organic compounds, Chemical wastes, Lipids, Sediments, Infrared radiation, Ultraviolet radiation, Spectrophotometry.
Identifiers: *River pollution, *Micropollutants, *Danube River(Hungary), Petroleum derivatives, Phenol derivatives, Budapest(Hungary).

Of the polluting substances present in surface waters greatest importance is attributed to the micropollutants. Concerning the water quality of the Danube river, among the micropollutants, special attention should be devoted to the petroleum and phenol derivatives, further to some heavy metals (mercury, zinc, etc.). Phenolic compounds in the low concentrations encountered are readily soluble in water, so that they are present in small quantities only in the suspended solids and in the bottom sediment. Petroleum derivatives and fats

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e of great importance in this respect together ith some heavy metals, which tend to absorb to e suspended solids, respectively to form ecipitates and thus to settle to the bottom. The vestigations on quality variations were carried t over a Danube section upstream of Budapest. is section offers a model opportunity for study- g changes in the pollutants tending to separate d form precipitates in water, the settling thereof a function of flow conditions and time, etc. ese investigations have offered an explanation r the 'disappearence' of the persistent sub- nces, which has been observed during the regu- water analyses. The results of analyses per- rmed on the water as well as on the bottom sedi- nt were discussed. (Henley-ISWS)
76-02692

GRICULTURAL RUNOFF POLLUTES SUR- CE WATERS, PART I,
uth Dakota State Univ., Brookings. Dept. of vil Engineering.
L. Harms, P. Middaugh, J. N. Dornbush, and J. Andersen.
ter and Sewage Works, Vol 122, No 10, p 84- October 1975. 2 tab. EPA R-800400.

scriptors: *Water pollution sources, gricultural runoff, *South Dakota, *Water ality, On-site investigations, Agricultural tersheds, Sampling, Surface runoff, Rainfall, owmelt, Bacteria, Coliforms, Streptococcus, getation effects, Oats, Corn(Field), Pastures, alfa, Bromegrass, Soil texture, Loam.
ntifiers: Bacteriological quality, Sandy clay.

blished title is in error. Title should be cteriological Quality of Surface Runoff From ricultural Land, Part 1.' Data collected during a ent two-year study of surface runoff from 91 wmelt and 32 rainfall events from seven sites in tern South Dakota indicated that runoff from cultural lands may be a significant source of ution for surface waters. Agricultural runoff is non-point source of water pollution; con- uently, it is virtually uncontrollable. The data sented pertain only to surface runoff from cultural land and were collected to obtain in- nation regarding the densities of the bac- ological indicator organisms in surface runoff relate these densities to water quality criteria would apply to the receiving waters. All field ditions were natural and uncontrolled. General information for drainage area, crop cover, and texture were tabulated. Samples were taken odically throughout each runoff event, and a le composite sample was made from the in- dual samples for a particular site. The com- te sample represented the entire runoff event the individual aliquots representing the por- of flow that occurred during a sampling od. Analysis of data was published in Water Sewage Works, Vol 122, No 11, November . (See also W76-02695) (Humphreys-ISWS)
-02694

TERIOLOGICAL QUALITY OF SURFACE OFF FROM AGRICULTURAL LAND, T II,
h Dakota State Univ., Brookings. Dept. of Engineering.
Harms, P. Middaugh, J. N. Dornbush, and J. ndersen.
er and Sewage Works, Vol 122, No 11, p 71- November 1975. 4 fig, 2 tab, 22 ref. EPA R- 00.

riptors: *Water pollution sources, icultural runoff, *South Dakota, *Water ty, On-site investigations, Agricultural rsheds, Sampling, Surface runoff, Rainfall, rmelt, Bacteria, Coliforms, Streptococcus, tation effects, Oats, Corn(Field), Pastures, fa, Bromegrass, Soil texture, Loam.
ifiers: Bacteriological quality, Sandy clay.

Data collected during a recent two-year study of surface runoff from 91 snowmelt and 32 rainfall events from seven sites in eastern South Dakota indicated that runoff from agricultural lands may be a significant source of pollution for surface waters. Total coliform, fecal coliform, and fecal streptococcus determinations were made. In general, the runoff from fields that had minimum cover, such as corn stubble, showed higher total coliform densities. Fields with heavier cover are those with oats stubble, permanent bromegrass and alfalfa, and permanent pasture, and runoff from these fields exhibited low total coliform. Some variations between vegetation covers exist for fecal coliforms, but no distinct separation was apparent. One factor that tends to remove any distinction because of cover would be the common practice of pasturing cattle on most of the fields in the fall. The bacteriological data showed that surface runoff waters from agricultural lands have indicator organism counts that frequently exceed the water quality standards. Addition of these runoff waters to a watercourse can cause degradation and can be construed as pollution. Total coliform densities were usually somewhat greater than fecal streptococcus levels. This relationship would probably be influenced by the coliform organisms that are found in the soil, and it does not necessarily indicate fecal contamination or the presence of pathogenic organisms. (See also W76-02694) (Humphreys-ISWS)
W76-02695

STRATIFIED LAKE AND OCEANIC BRINES: SALT MOVEMENT AND TIME LIMITS OF EXISTENCE,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
D. J. Toth, and A. Lerman.
Limnology and Oceanography, Vol 20, No 5, p 715-728, September 1975. 7 fig, 4 tab, 30 ref. NSF DES 71-0048.

Descriptors: *Salinity, *Saline lakes, *Diffusion, *Stratification, *Brines, Antarctic, Arctic, Lakes, Model studies, Water pollution sources, Path of pollutants.
Identifiers: *Salt diffusion coefficient, *Salt transport, *Great Bitter Lake(Egypt).

Pronounced salt concentration gradients in five antarctic, arctic, and Pacific coastal lakes can be accounted for by diffusional transport of salt out of the deeper saline water layers. The computed values of the mean salt diffusion coefficients, based on the ages of salinity stratification, agree to within an order of magnitude with molecular diffusivities for four out of five lakes. This agreement suggests that no major mixing events occurred in the water column during the late historical stages of the lakes. Upper limit time estimates for the removal of most of the salt from the saline bottom layers range from 5000 to 35,000 years, depending on lake depth. Historical records of deepening of the Great Bitter Lake owing to dissolution of a salt layer on the bottom suggest that dissolution was a diffusion controlled process. For the saline brines in the Red Sea Deeps, an assumption that they are transient structures leads to the following estimates of the time to mixing with Red Sea water: 1000-10,000 years, if mixing takes place by diffusional transport of salt between the heavier and lighter brines, and 10,000-100,000 years, if salt diffuses from the brines upward. The geologically short range of times suggests that the possible recycling of times suggests that the possible recycling of evaporative brines through the deeper ocean could not affect the ocean water salinity for any significant time interval. (Lardner-ISWS)
W76-02696

PARTICLE SIZE DISTRIBUTIONS IN A REGION OF COASTAL UPWELLING ANALYZED BY CHARACTERISTIC VECTORS,
Oregon State Univ., Corvallis. School of Oceanography.
J. C. Kitchen, D. Menzies, H. Pak, and R. V. Zaneveld.
Limnology and Oceanography, Vol 20, No 5, p 775-783, September 1975. 7 fig, 1 tab, 10 ref.

Descriptors: *Particle size, *Chlorophyll, *Oregon, Temperature, Salinity, Phytoplankton, Upwelling, Oceanography, Coasts, Oceans, Ecosystems, Biology, Ecology, Distribution patterns, Ocean circulation, Path of pollutants.
Identifiers: *Particulate carbon, Characteristic vectors, Ekman transport, Ocean ecology.

Particle size distributions (8-105 micrometer diameter), chlorophyll, and particulate carbon were measured off the Oregon coast during July 1973. The particle counts were transformed to volume concentration and then subjected to characteristic vector analysis. Ninety-two per cent of the variance was accounted for by linear combinations of the first two characteristic vectors. Two weighting factors defined the proportions of the two characteristic vectors which will, when added to the mean volume concentration curve, approximate the actual data for each sample. Variations in the first weighting factor corresponded well with variations in total volume. Changes in the second weighting factor indicated which segment of the size range contains the largest proportion of the particulate volume. Comparison with temperature and salinity data indicated that the near surface water with proportionately large volumes of particles less than 20 micrometer was warmer and less saline than the surface waters with large volumes between 20 and 50 micrometer. High correlation with particulate carbon and chlorophyll suggested that in both cases a large proportion of the particles is phytoplankton. (Lee-ISWS)
W76-02697

RAIN SCAVENGING OF SO2 AND SULFATE FROM POWER PLANT PLUMES,
Battelle-Pacific Northwest Labs., Richland, Wash. Atmospheric Sciences Dept.
For primary bibliographic entry see Field 5A.
W76-02712

GROUNDWATER POLLUTION FROM SANITARY LANDFILL LEACHATE, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W76-02733

THE EFFECT OF INCREASING THE ORGANIC CARBON CONTENT OF SEWATE ON NITROGEN, CARBON, AND BACTERIA REMOVAL AND INFILTRATION IN SOIL COLUMNS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W76-02741

TRANSFORMATIONS IN QUALITY OF RECHARGING EFFLUENT IN THE SANTA CRUZ RIVER,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5E.
W76-02750

ACCUMULATION OF THE IRON GROUP ELEMENTS BY PHYTOPLANKTON, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
V. V. Gromov, and E. G. Starodubtsev.
Okeanologiya, 14(6), 1006-1011, Illus, 1974.

Descriptors: *Phytoplankton, *Pacific Ocean, Oceans, *Iron, *Metals, Nickel, Manganese, Cobalt, *Absorption.
Identifiers: Detritus, Platymonas-Viridis, Peru.

Phytoplankton (a culture of Platymonas viridis and a natural community taken from the upwelling area in the Pacific Ocean off Peru) accumulates the elements of the Fe group in the order: Fe > Ni > Mn > Co. The accumulation rates decrease in the same order. The absorbed elements are concentrated mainly in phytoplanktonic detritus.--Copyright 1975, Biological Abstracts, Inc.
W76-02772

FORMATION OF METHYL MERCURY BY BACTERIA,
Georgia Univ., Atlanta. Dept. of Food Science.
For primary bibliographic entry see Field 5A.
W76-02812

EVIDENCE FOR THE PRESENCE OF MUTAGENIC POLLUTANTS IN THE MILLERS RIVER: RESULTS OF A PLANT BIOASSAY SYSTEM,
Massachusetts Univ., Amherst. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-02869

TRITIUM AND DEUTERIUM AS WATER TRACERS IN HYDROLOGIC SYSTEMS,
Massachusetts Univ., Amherst. Water Resources Research Center.
G. L. Stewart, and J. R. Stetson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 408, $4.00 in paper copy, $2.25 in microfiche. Water Resources Research Center Pub No 55, Completion Report FY-76-2, May 1975. 44 p, 19 fig, 3 tab, 25 ref. OWRT A-045-MASS(2). 14-31-0001-4021.

Descriptors: *Tritium, *Tracers, Evaluation, Porous media, *Deuterium, *Path of pollutants, Infiltration, Soils, Clay minerals, Water pollution sources.

A study was conducted to evaluate the suitability of deuterium and tritium as tracers to depict water and pollutant movement in porous media. This involved studying the interaction of these tracers with soil materials and evaluating this interaction in terms of retardation in tracer flow velocity, compared to bulk water flow. Previous work had suggested that tritium and deuterium interact with soils and are removed from tracer solution during flow. The data presented clearly show that a tracing front becomes diluted in tracer during infiltration into oven-dried soil. There appears to be very little difference between the degree of tritium and deuterium interaction. The source of interaction is demonstrated to be primarily hydroxyl associated with the clay minerals. These exchange sites are destroyed by heating soil to 700C. which climinates tracer loss during infiltration.
W76-02870

DISTRIBUTION OF MERCURY, CADMIUM, LEAD AND THALLIUM IN A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
B. J. Mathis, and N. R. Kevern.
Hydrobiologia, Vol 46, No 2-3, p 207-222, 1975. 6 fig, 3 tab, 20 ref.

Descriptors: *Metals, *Distribution, *Water pollution sources, Lakes, *Mercury, *Cadmium, *Lead, *Michigan, Bottom sediments, Fish, Industrial wastes, Toxins, Aquatic plants, Water, Food chains, Diptera, Daphina, Bass Yellow perch, Bullheads, Sunfishes, Zooplankton, Waterfowl, Atmospheric fallout.
Identifiers: *Thallium, Wintergreen Lake(Mich), Chubsuckers, Coontail, Yellow pond-lily.

Mercury was detected in the bottom sediments of Wintergreen Lake, Michigan, and in decreasing concentrations in largemouth bass, hybrid sunfish, yellow perch, yellow bullhead, and lake chubsuckers. In largemouth bass muscle tissue, mercury was highly correlated with length and weight. Mean mercury concentrations in fish tissue exceeded mean levels in bottom sediments. Apparently fish build up a body mercury level in systems where mercury in some components is undetectable. Cadmium and lead were highly concentrated in bottom sediments and were found in all lake components. Ceratophyllum demersum and Nuphar stems and roots had more cadmium than any fish. Zooplankton (Chaoborus and Daphnia) contained cadmium and lead. Thallium was detected only in sediments. Lake sediments acted as a sink for all four metals. A high degree of correlation was not evident between the other metals and fish weight and length. Migratory waterfowl feces contained high cadmium and lead concentrations which may be a major source of contamination. Fallout from airborne particulate matter may be a secondary source for cadmium and lead, but is the primary pathway by which mercury and thallium enter the lake. (Buchanan-Davidson--Wisconsin).
W76-02898

NONPOINT SOURCE MINERAL WATER QUALITY MODEL,
Tennessee Valley Authority, Knoxville. Hydraulic Data Branch.
R. P. Betson, and W. M. McMaster.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2461-2473, October 1975. 6 tab, 27 ref.

Descriptors: *Model studies, *Water quality, *Mineral water, *Computer models, *Water quality control, *Tennessee Valley Authority, Analytical techniques, Demonstration watersheds, Mathematics, Water, Water analysis, Water chemistry, Chemical analysis, Water pollution control, Water pollution sources, Sulfates, Dissolved solids, Mathematical models, Watersheds(Basins), Mineralogy, Strip mines, Calibrations, Suspended solids, Rating curves.
Identifiers: *Water quality model, *Nonpoint pollution sources, *Mineral quality, *Mineral constituents, *Tennessee Valley, Constituent concentration, Mineral quality simulation, Point pollution sources.

The mineral water quality model can be used at unsampled locations to simulate the concentration and/or transport of constituents under natural conditions by using available map measures alone. It is a first-generation model because it is designed to be calibrated by using existing data. The model has been regionalized by using data collected in the Tennessee Valley, which includes a variety of conditions. The model was tested on 12 watersheds not used in calibration. These test areas included six physiographic provinces. The results obtained indicated that the model usually can simulate well within the range of values typically observed for a constituent. The average absolute simulated error for 24 samples was within + or - 30% for many constituents and was above 60% for only two mineral constituents. The model represents an efficient way to represent water quality information. The essential information for many analyses in a region is contained in 15 pairs of equations that may easily be stored in a computer to provide an automatic natural water quality simulation capability. (Henley-ISWS)
W76-02922

EVALUATION OF THE STRENGTH AND SEAKEEPING ABILITY OF POLLUTION CONTROL BARRIERS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-02929

REPORT ON INVESTIGATION OF WATER QUALITY OF CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
Report, January 1975. 55 p, 5 fig, 20 photo, 10 tab, 12 ref.

Descriptors: *Water quality, *Runoff, *Surveys, *Minnesota, *Nutrients, Water pollution sources, Pollutant identification, Water pollution, Path of pollutants, Pollutants, Watersheds(Basins), Lakes, Surface waters, Domestic animals, Farm wastes, Water balance, Septic tanks, Domestic wastes, Streamflow, Drainage, Erosion, On-site investigations.
Identifiers: *Christmas Lake(Minn).

The investigation of Christmas Lake in Carver and Hennepin Counties (Minnesota) was undertaken by the Minnesota Pollution Control Agency as an amicus curiae (friend of the court) to provide technical information of the water quality of Christmas Lake Watershed. The objective of the study was to determine the nutrient sources of Christmas Lake and their relative contributions to the nutrient budget and specific loading of the lake. This report culminated the field investigation and sampling of Christmas Lake and its watershed by personnel of the Division of Water Quality, and covered data collected from April 1973 through April 1974. Characteristics of Christmas Lake described in this report were nutrient sources, hydrologic budget, nutrient budget, specific loading rates and bacteriological water quality of its tributaries. Those characteristics which could not or were not directly measured were estimated on the basis of a literature review of similar research in the same subject area. From the data collected during the survey period, four sources were identified as contributors of nutrients to Christmas Lake Creek: Twin Hills property, Metcalf property, natural runoff, and County Road 17 right-of-way runoff. All water quality data which was collected on Christmas Lake Creek has been compiled and analyzed to determine relative nutrient concentrations within the creek. It was apparent from the data collected that the majority of nutrients are contributed during spring snowmelt and after significant rainstorms. (Sims-ISWS)
W76-02931

LIMESTONE BARRIERS TO NEUTRALIZE ACIDIC STREAMS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5G.
W76-02938

INVESTIGATION OF MATHEMATICAL MODELS FOR THE PHYSICAL FATE PREDICTION OF DREDGED MATERIAL,
Army Engineer Waterwasys Experiment Station, Vicksburg, Miss. Office of Dredged Material Research.
B. H. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-776 368, $4.50 in paper copy, $2.25 in microfiche. Technical Report D-74-1, March 1974. 54 p, 4 fig, 59 ref, 1 append.

Descriptors: *Dredging, *Mathematical models, Spoil banks, Dispersion, Pipelines, Estuarine environment, Wastes, Waste disposal, Sands, Gravels, Aquatic environment, Harbors, Clays, Silts, Disposal, Inland waterways, Diffusion, Tidal effects, *Path of pollutants.
Identifiers: *Dredged materials, Dynamic collapse, Riverine environment, Sensitivity analysis, Disposal site.

A literature search of technical journals coupled with contacts with other research groups revealed that very little mathematical modeling of the physical fate of dredged material disposed of in an aquatic environment had been undertaken. The most significant modeling effort that was found was a mathematical model for prediction of dispersion and settling in barged ocean disposal of wastes developed by R.C.Y. Koh and Y.C. Chang.

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This model allowed for disposal of dredged material by instantaneous bottom dump as well as pumping the material through a pipe under a moving barge. In both disposal operations, the material was traced through three possible phases: convective descent, dynamic collapse, and long-term diffusion. The dynamic collapse was also generalized to account for the possibility that the cloud had hit the bottom. As a result of investigations of identified models and relevant transport studies, the following recommendations were offered: (1) in the ocean environment, sensitivity analyses and field verification of the Koh-Chang model are needed; (2) model development in the area of predicting the short-term fate of dredged material in the vicinity of the disposal site is needed for the estuarine environment; and (3) no model development is recommended for the river disposal problem until further investigation of a project by Schroeder at Oregon State University is completed. (Roberts-ISWS)
W76-02946

EFFECTS OF ORGANIC SOLUTES ON CHEMICAL REACTIONS OF ALUMINUM,
Geological Survey, Menlo Park, Calif.
C. J. Lind, and J. D. Hem.
Available from Supt of Documents, GPO, Wash, DC 20402, price $1.35. Water-Supply Paper 1827-G, 1975. 83 p, 42 fig, 13 tab, 82 ref.

Descriptors: *Chemical reactions, *Water chemistry, *Aluminum, *Organic compounds, Solutes, Natural resources, Labortory tests, Analytical techniques, Inorganic compounds, Physical properties, Geology, Chemical properties, Aqueous solutions.

Concentrations of organic matter in the general range of 1-10 milligrams per litre organic carbon are common in natural water, and many naturally occurring organic compounds form aluminum complexes. The aluminum concentrations in near-neutral pH solutions may be 10-100 times higher than the values predicted from solubility data if formation of such organic complexes is ignored. The processes of polymerization of aluminum hydroxide and precipitation of gibbsite are inhibited by the presence of the organic flavone compound quercetin in concentrations as low as 10 to the minus 5.3 mole per litre. In the presence of both dissolved aluminum and aqueous silica, low concentrations of quercetin improved the yield of crystallized kaolinte and halloysite. Small amounts of well-shaped kaolinte and halloysite crystals were identified by electron microscopy in solutions with pH's in the range of 6.5-8.5 after 155 days aging in one experiment and 481 days aging in a repeated experiment. The improved yield of crystalline material obtained in the presence of quercetin probably is the result of the influence of the organic compound on the aluminum hydroxide polymerization process. Natural water containing color imparted by organic material tends to be higher in aluminum than would be predicted by pH, silica concentrations, and solubility data for inorganic aluminum species. (Woodard-USGS)
W76-02953

VALUATION OF COPPER ACCUMULATION IN PART OF THE CALIFORNIA AQUEDUCT,
Geological Survey, Menlo Park, Calif.
F. H. Fuller, and R. C. Averett.
Water Resources Bulletin, Vol 11, No 5, p 946-962, October 1975. 1 fig, 2 tab, 9 ref.

Descriptors: *Copper sulfate, *Surface waters, Environmental effects, *Ecosystems, *Water treatment, Phytoplankton, Algae, Data collections, Sampling. Path of pollutants, Water pollution effects, Water quality, Sediments, California.
Identifiers: *California aqueduct, Absorption(Bioaccumulation).

Copper sulfate has been used extensively in the California Aqueduct to control phytoplankton and the algae Cladophora. Since 1969 more than 250,000 pounds of copper sulfate has been added to a part of the aqueduct. Although copper sulfate is effective in controlling algae, copper tends to accumulate in the system in which it is applied. Samples of water, biota including plants, clams, and snails, as well as sediment were analyzed for copper. Results of these analyses showed that copper concentrations in the water, with three exceptions, were less than 10 micrograms per litre. Samples of plant tissue showed a 198 percent increase in copper concentration in the treated reach of the aqueduct, and clam tissue showed a 68 percent increase. Snails in the treated reach had 77 percent more copper than in the untreated reach whereas copper concentrations in the sediment doubled. None of the concentrations found are considered to be harmful to the biota. (Woodard-USGS)
W76-02957

5C. Effects Of Pollution

ZOOPLANKTON PRODUCTION IN LAKE ONTARIO AS INFLUENCED BY ENVIRONMENTAL PERTURBATIONS,
State Univ. of New York at Albany. Dept. of Biological Sciences.
D. C. McNaught, M. Buzzard, and S. Levine.
Available from the National Technical Information Service, Springfield, Va 22161. Envrionmental Protection Agency, Report EPA-660/3-75-021, June 1975. 156 p, 19 fig, 19 tab, 47 ref, 2 append. EPA 1BA026. Grant 800536.

Descriptors: *Zooplankton, *Lake Ontario, Lakes, Great Lakes, *Primary production, Nutrients, *Eutrophication, Model studies.

The Crustacean zooplankton are excellent indicators of environmental perturbation, especially if enough of their biology is known to explain why certain species increase with nutrient enrichment of lakes. The distribution of zooplankton in Lake Ontario suggested that eutrophic indicators were found in the vicinity of major urban centers. The ratio of the number of Bosmina longirostris, the most successful eutrophic species, to Diaptomus sicilis, the most oligotrophic form, supported this conclusion. Furthermore, mathematical indices, including diversity, the community competition coefficient, and carrying capacity, separated urban inshore from rural inshore waters, further evidence of perturbation. Biomass estimates made with new acoustical techniques indicated that most of the zooplankton biomass was in deep waters, thus the eutrophication of Ontario's waters, both nearshore and in the vicinity of cities, is still localized in nature. Mathematical techniques have been developed to model such perturbations. (EPA).
W76-02502

SESTON AND PERIPHYTON OF THE RIVER VISTULA ON THE SECTOR FROM NOWY BIERUN TO THE WATER STAGE AT LACZANY AND ON THE LACZANY: SKAWINA CANAL (IN POLISH),
Polish Academy of Science, Krakow. Zaklad Ochrony Przyrody.
For primary bibliographic entry see Field 5B.
W76-02513

PREDICTING EFFECTS ON FISH OF FIRE RETARDANTS IN STREAMS,
Forest Service (USDA), Ogden. Intermountain Forest and Range Experiment Station.
W. P. Van Meter, and C. E. Hardy.
U.S. Department of Argriculture, Forest Service, Research Paper INT-166, June 1975, 16 p, 7 fig. 11 ref, 1 tab.

Descriptors: *Fish, *Toxins, *Streams, *Water pollution effects, *Water pollution sources, Hazards, Poisons, Lethal limit, Chemicals, Retardants, Pollutants, Water pollution, Toxicity.
Identifiers: *Fire retardants.

A method of estimating the hazard to game fish caused by release of fire-retardant chemicals into streams is described. Field measurements necessary for application of the method are (1) the amount of retardant (pounds of nitrogen, calculated as ammonia) that enters a stream and (2) the discharge rate and average velocity of the stream, both measured at or near the point of retardant introduction. The result is an estimate of the time, or distance, necessary to allow dilution of the pollutant by shear and turbulent mixing to produce nonlethal conditons. (Witt-IPC)
W76-02519

CLEARCUTTING AND BURNING SLASH ALTER QUALITY OF STREAM WATER IN NORTHERN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-02522

EQUILIBRIUM ADSORPTION OF INORGANIC PHOSPHATE BY LAKE SEDIMENTS,
Massachusetts Univ., Amherst.
W. C. Ku.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 75-16,572. PhD Thesis, 1975, 205 p.

Descriptors: *Equilibrium, *Adsorption, *Phosphorus compounds, *Lake sediments, Temperature, Oxidation-reduction potential, Environment, Mathematical models, Isotope studies, Eutrophication, Water pollution, Iron, Aluminum, Hydrogen ion concentration, *Massachusetts.
Identifiers: *Surface sediments, Lake Warner(Mass), Lake Wyola(Mass), Langmuir adsorption equation, Isotopic exchange.

Eutrophication has become a problem of national concern. An understanding of the behavior of phosphorus in different waters is essential to insure control of eutrophication. A study was undertaken on Lake Warner and Lake Wyola, both in Massachusetts, on the adsorption of inorganic phosphates in surface sediments. The pH, temperature, and redox potential were studied. An isotopic exchange method, using P32, was used to determine the phosphorus attached to the surface of the sediment, and to determine the adsorption maxima. For the two lakes studied, the Langmuir adsorption equation accurately described the phosphate adsorption data. Adsorption capacities for the sediments increased as pH and temperature decreased but as redox potential increased. Iron and aluminum were important in the fixation of phosphate in lake sediments, the relative importance depending on the type of sediment and the environmental conditions prevailing in the sediment. It was found that changes in redox potential caused changes in the amount of iron released from the sediment but had no effect on the aluminum. Redox potential can be used as an important parameter for sediment phosphate adsorption studies. The data derived from these studies can be used for mathematical models for the prediction of the phosphate exchange processes between lake sediment and the overlying waters. (Pinto-FIRL)
W76-02562

A SIMULATION MODEL FOR STUDYING EFFECTS OF POLLUTION AND FRESHWATER INFLOW ON SECONDARY PRODUCTIVITY IN A ECOSYSTEM,
North Carolina State Univ., Raleigh.
R. W. Johnson.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No 75-17,101. Ph.D. Thesis, 1975, 121 p.

Descriptors: *Model studies, *Water pollution effects, Environmental effects, Water management(Applied), Water resources development, Estuarine fisheries, Estuarine environment, Texas, Data collection, Simulation analysis, Model studies, Water pollution control, Shrimp, Fish migration, Fish management.

A simulation model was developed to evaluate the ecosystem of Galveston Bay, Texas. The effects of humans on secondary productivity (harvestable species such as fish and shellfish) is defined in terms of factors such as quantity and quality of inlet fresh water and pollutants. Information was derived from existing physical parameters model and from pertinent biological measurements. The purpose of this model is to provide predictive information for the management of estuaries. The results were particularly useful to pollution control and fisheries management in systems having migrating species of fish, shrimp, and crabs. The Galveston Bay, Texas, area was found to be a highly productive temperate-zone ecosystem, subject to human related stresses. An objective of this study was to identify which biological, chemical, and physical parameters should be measured for the development of models of similar ecosystems. (Kramer-FIRL)
W76-02567

DIURNAL OSCILLATIONS OF OXYGEN CONCENTRATION IN THE PHOTOSYNTHETIC LAYER AND PRIMARY PRODUCTION COMPUTATION, (IN RUSSIAN),
V. B. Tseitlin.
Okeanologiya, Vol 14, No 6, p 1087-1091, 1974. Illus. (Engl. summ.).

Descriptors: *Phytoplankton, Plankton, Measurement, *Diurnal distribution, *Oceans, *Photosynthesis, *Primary productivity, Dissolved oxygen.

An estimate is obtained of the diurnal oscillations of dissolved oxygen concentration in the photic layer. The existing accuracy of measurements does not permit this value to be used for computing (phytoplankton) primary production in the ocean.--Copyright 1975, Biological Abstracts, Inc.
W76-02588

CHARACTERISTICS OF THE RADIATION CONDITIONS OF DEVELOPMENT OF EGGS OF FRESHWATER FISHES BELONGING TO DIFFEENT ECOLOGICAL GROUPS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
G. B. Pitkyanen, and Yu. A. Zaitsev.
Ekologiya. 5(6): 73-75. 1974.

Descriptors: Fish, Freshwater fish, *Pike, *Perch, *Irradiation, Radioisotopes, *Cesium, *Strontium radioisotopes, *Fish eggs.
Identifiers: Cesium-137, *Eggs, Esox-Lucius, Perca-Fluviatilis, Strontium-90.

An evaluation is given of doses created by isotopes Sr90 and Cs137 in the eggs of fishes (pike, Esox lucius; perch, Perca fluviatilis) developing under natural conditions. The dose from the following irradiation sources was estimated: isotopes accumulated by the egg content; isotopes preferentially sorbed by the egg membrane; isotopes dissolved in water; and isotopes sorbed by the bottom deposits. When predicting the effect of ionizing radiation on developing eggs it is necessary to take into account the ecological conditions of the developing eggs and to calculate the doses received by them before oviposition.--Copyright 1975, Biological Abstracts, Inc.
W76-02615

A LAKE--HOW DOES IT BEHAVE,
Texas Univ. at Austin. Dept. of Civil Engineering.
G. A. Rohlich.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 31-39.

Descriptors: *Control, *Lakes, *Eutrophication, Lake stages, Economic impact, Effluents, Zoning, Urban runoff, Sewage treatment, Nutrient removal, Wisconsin.

The definition of a lake as a body of water surrounded by land is too restrictive, since the entire lake basin influences the character and behavior of the lake. The importance of stratification, benthos, and eutrophication are discussed. Unpolluted waters have a wide variety of species and a dynamic biological balance. Under eutrophic conditions, there are comparatively few species which dominate with the consequent absence of biological balance. Domestic and industrial waste waters are sources of organic materials and energy. The trophic nature of a lake is influenced by climatic conditions, topography, conformation, wind patterns, geology, erosion, and human influences. Techniques for measuring eutrophication are discussed. Eutrophication affects water quality, water supplies, recreational uses, and agricultural uses. Approaches which have been taken to solve eutrophication problems are mentioned, e.g., diversion of effluents around a lake (as in Lakes Mendota and Kegonsa, Madison, Wisconsin; Lake Tahoe, Nevada-California; and Lake Washington, Washington); urban drainage; removal of weed debris and rough fish; dredging of lake sediments; withdrawal of hypolimnetic water; watershed zoning; and control of nuisance plant growth. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02644

ALTERNATIVES TO PROTECT AND ENHANCE LAKES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-02648

THE FACTS OF LIFE,
Wisconsin Univ. Center System-Marinette County, Bay Shore. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-02651

HIGHWAY AND SEWER IMPACTS ON URBAN DEVELOPMENT,
Environmental Impact Center, Inc., Newton, Mass.
F. T. Rabe, and J. F. Hudson.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol 101, No UP2, p 217-231, November 1975. 4 fig, 4 tab, 5 equ, 25 ref.

Descriptors: *Planning, *Sewers, *Highways, *Statistical methods, *Investment, Land use, Waste water(Pollution), Public utilities, Employment, Estimating, Regression analysis, Mathematical models, Equations, Systems analysis, Construction.
Identifiers: *Environmental impact statements, *Urban development, Housing, Residential.

Public investments in highways and sewerage facilities have an important influence on the form, location, and timing of urban development. However, the magnitude and variability of this influence remains uncertain. Statistical analyses of historical highway and sewer investments in four U.S. metropolitan areas suggest that the role of these public investments in bringing about new urban growth depends upon local land market conditions, as well as existing levels of wastewater and transportation service. Simple models were estimated that relate the amount of residential, commercial, and industrial development to the availability of vacant land, sewer service, proximity to highways, and residential vacancy rates. These models provide a preliminary analytical basis for projecting the likely effects of proposed highway and sewer projects on local urban development.
W76-02717

SIGNIFICANCE OF VITAMINE B12 IN MARINE BIOCENOSES, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 5A.
W76-02719

EFFECTS OF SURFACE CONFIGURATION IN WATER POLLUTION CONTROL ON SEMIARID SURFACE MINED LANDS,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
For primary bibliographic entry see Field 5G.
W76-02726

SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: RESEARCH RESULTS,
Environmental Impact Center, Inc., Newton, Mass.
S. E. Bascom, K. G. Cooper, M. P. Howell, A. C. Makrides, and F. T. Rabe.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-600/5-75-013, July 1975. 209 p, 19 fig, 28 tab, 27 ref, 3 append. 1HA095 21 ART 11, EQC 317.

Descriptors: Analytical techniques, Regional development, Community development, Land use, Water resources, Planning, Data collections, Storage and retrieval, Environment, Highways effects, *Investments, *Waste water treatment, *Transportation.

This report is the second of a two-part research study. The first report involved an extensive review of previous research pertaining to secondary effects of highways, mass transit, wastewater treatment and collection systems, and of land use models which might be utilized to preject secondary environmental effects. The report is published under the title: 'Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography', (EPA No. 600/5-75-002, January, 1975). The second report (this publication), presents the results of original research on the extent to which secondary development can be attributed to highways and wastewater treatment and collection systems, and what conditions under which causal relations appear to exist. Case studies of recent development trends were made in four metropolitan regions: Boston, Massachusetts; Denver, Colorado; Washington, D.C.; and Minneapolis-St. Paul, Minnesota. Data for the four metropolitan regions were analyzed using econometric techniques and simulation modeling. The data tape (TMP 243) is stored with Optimum Systems Incorporated, Washington, D.C. This report consists of four sections: an Introduction and Summary of Findings; a technical documentation of case studies and econometric analysis; an evaluation of the Findings and Suggestions for Further Research; and Appendices summarizing the dynamic model and its application. (EPA)
W76-02757

LAKE CLASSIFICATION--A TROPHIC CHARACTERIZATION OF WISCONSIN LAKES,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 2H.
W76-02764

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SURVIVAL OF PATHOGENS IN ANIMAL MANURE DISPOSAL,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
S. L. Diesch, P. R. Goodrich, B. S. Pomeroy, and L. A. Will.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 005, $6.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-012, June 1975. 129 p, 16 fig, 60 tab, 44 ref, append. EPA 1BB039. R 802205.

Descriptors: *Oxidation lagoons, Dispersion, Aerosols, *Public health, *Farm wastes, Salmonella, Cattle, Environmental sanitation, *Waste treatment, Seasonal.
Identifiers: Pathogens, Pasveer ditch, Zoonoses, Leptospira, Leptopirosis.

A research project was conducted to measure and evaluate the public health effects of pathogens in beef cattle manure found in the extended aeration system of waste disposal. Model oxidation ditches were used in laboratory studies. At simulated summer and winter environmental conditions, determinations were made of the viability and infectivity of leptospires in weanling hamsters and salmonella in turkey poults. Salmonella was transmitted by aerosols, but leptospires were not. In reseeding contaminated slurry contents salmonella was transmitted but leptosphires not. Leptospires isolated from the slurry of the model ditch 17 days after seeding had lost measurable virulence. Measurements of selected microbial aerosols were made in the vicinity of a field ditch. Bacterial levels of 100-200 total colony-forming units per liter of air were associated with the beef cattle population in the housing unit and not with aerosols generated by the oxidation ditch treatment system. Studies were made on a model oxidation dithc simulating the field ditch. The winter temperature conditions (2-5 dec C) slowed the degradation process considerably and high dissolved oxygen was maintained. (EPA)
W76-02765

PRINCIPAL TENDENCIES IN THE BIOLOGY OF THE MODERN BALTIC SEA, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Okeanologiya.
A. A. Nikolaev.
Okeanologiya, 14(6), 1059-1069, Illus, 1974.

Descriptors: *Oceans, *Eutrophication, *Wildlife, Aquatic wildlife, Agricultural wastes, *Water pollution, Growth rates, Populations.
Identifiers: *Baltic Sea, Invertebrate, USSR.

During the last 50-60 yr the following tendencies have become apparent in the biology of the Baltic Sea: enrichment of the fauna (e.g., invertebrates, fish) and flora through the penetration of saltwater species from the North Sea and Scandinavian waters; enrichment of the fauna of warm-water species also from the west (this tendency was pronounced from 1920-1930); enrichment of the fauna due to a spontaneous anthropogenic dispersion of the marine and saltwater species of different marine basins; and anthropogenic eutrophication of the sea. The tendency has been most pronounced during the last 10-15 yr. It reflects the increasing pollution of the sea by organic matter and inorganic biogenic matter, in particular from the cultivated agricultural areas within the Baltic Sea basin.--Copyright 1975, Biological Abstracts, Inc.
W76-02770

ACCUMULATION OF THE IRON GROUP ELEMENTS BY PHYTOPLANKTON, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W76-02772

TOXICITY OF COPPER COMPLEXES TO FRESHWATER MOLLUSKS,
V. T. Kapkov.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-763 967, $3.50 in paper copy, $2.25 in microfiche. Typescript, 5 p, 1 fig, 1 tab. Trans from Pochvovedenie, Vol 26, No 2, 1971.

Descriptors: *Heavy metals, Copper, Copper compounds, *Toxicity, *Mollusks, Water pollution, Environmental effects, Animal pathology, Adsorption, Bioassay, Toxins, Spectrophotometry, Water pollution effects, Lethal limit.
Identifiers: Pyridine, *Pyridine homologues, *Copper complexes, *Moscow River, Freshwater mollusks, Gills, Bivalve mollusks, Gastropod mollusks.

Information is presented on the toxicity, for fresh water mollusks, of copper complexes with pyridine, alpha-, beta-picoline, and 2,6-lutidine in concentrations of 0.01 to 5.0 mg of copper liter. This information was compared with the toxicity of pyridine and its homologues alone and with the toxicity of copper ions along. Mollusks caught in the Moscow River were kept in 10 liter aquariums to which the test substances were added in solution. The pH, temperature, and water contents were kept constant. Solutions were changed in experimental and control aquariums after 48 hours. Alpha-picoline-copper and 2,6-lutidine of copper exerted a less toxic effect than cupric chloride, while dichloropyridine copper and a complex of copper with beta-picoline were more toxic. Toxicity was measured by death of the mollusks for periods up to 30 days. Pyridine and its homologues did not exert a toxic effect. Most copper absorption took place in the first 6 hours of the experiment. Active excretion of the copper from the mollusk occurred. The copper concentration was greatest in the gills, as determined spectrophotometrically. (Davis-Vanderbilt)
W76-02780

DYNAMICS OF HAZARDOUS ELEMENTS IN WASTEWATER PONDS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5D.
W76-02867

EVIDENCE FOR THE PRESENCE OF MUTAGENIC POLLUTANTS IN THE MILLERS RIVER: RESULTS OF A PLANT BIOASSAY SYSTEM,
Massachusetts Univ., Amherst. Dept. of Botany.
E. J. Klekowski, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 406, $4.50 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publ No 56, Completion Report FY-76-3, September 1975, 54 p. OWRT A-063-MASS(1). 14-31-0001-5021.

Descriptors: Pollutants, *Massachusetts, Industrial wastes, *Bioassay, *Cytological studies, *Chromosomes, Water pollution effects, Water pollution sources.
Identifiers: *Mutagenic pollutants, Millers River(Mass), Osmunda regalis, Royal fems, Heterozygous, Meiotic samples, Mutations.

A population of royal ferns, Osmunda regalis, which is periodically submersed by the waters of the Millers River was found to have a very high frequency of chromosome mutations. The Millers River is located in western Massachusetts and is heavily polluted with industrial wastes. Approximately 43% of meiotic samples collected in 1973 from the Millers River population were heterozygous for mutations such as paracentric inversions of reciprocal translocations whereas less than 1% of meiotic samples from nearby non-polluted control populations were such heterozygotes. Cytological analysis within royal fern clones indicate that practically all of the chromosome mutations were post-zygotically induced and that at least 64% were induced since 1969. In the course of this study over 26,000 spore mother cells were analyzed for chromosome aberrations. In addition, further studies were carried out screening sporophyte populations for detection of mutations. The level of mutational damage in the river population approximated that previously documented from the chromosome study, whereas control populations did not indicate any mutational damage to the sporophyte.
W76-02869

GEOCHEMICAL IMPACT ON LEAD-MINING WASTEWATERS ON STREAMS IN SOUTHEASTERN MISSOURI,
Missouri Univ., Rolla.
E. Bolter, J. C. Jennett, and B. G. Wixson.
Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayett, Indiana, Engineering Extension Series No 141, Part 2, p 679-686. 6 fig, 5 tab, 5 ref.

Descriptors: *Waste water treatment, *Heavy metals, *Mine water *Lagoons, Mining, *Lead, *Missouri, Streams, Water pollution effects, Copper, Zinc, Manganese.
Identifiers: Retention ponds.

Southeastern Missouri is now the site of the largest lead producing district in the world. Investigative results show how the mining activity affects the area's surface waters, and treatment methods of mine waters are described. During the first few years of mining, the heavy metal content of the streams rarely exceeded 20 microgram/1. However, below the point of the confluence of streams and the milling waste waters of several mines, a pronounced growth of bacterialagal slime was observed on the bottom of streams, probably stimulated by organic reagents in the milling water. Algal samples contained large amounts of rock flower, an indication that the algal mats act as a 'filter' for metal-rich rock flower from the tailing retention ponds. The small heavy metal content observed in the effluents of mine and mill water retention ponds indicated the high efficiency of the ponds in reducing this compound, thus permitting the lagoon effluents to be discharged into streams; excess heavy metals are probably precipitated as carbonates. Because of the minimal heavy metal content of the mine water in the effluents, it is recommended that mine and mill water effluents be separated and the latter recycled in order to eliminate algal slime in streams. (Auen-Wisconsin)
W76-02897

DISTRIBUTION OF MERCURY, CADMIUM, LEAD AND THALLIUM IN A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W76-02898

BAYTEX EFFECT ON SOME REPRESENTATIVES OF THE KARELIAM ASSR HYDROFAUNA, (IN RUSSIAN),
Akademiya Nauk SSSR, Petrozavodsk. Karelskii Filial.
Z. I. Filimonova.
Gidrobiol Zh. 53-60 Illus. 1974.

Descriptors: *Insecticides, *Mortality, *Water pollution effects, Crustaceans, *Copepods, *Daphmia.
Identifiers: Acanthocyclops-Sp, *Baytex effect, *Daphnia-Pulex, Karelian-ASSR, Methyl-0-4-Methylthio-M-Tolyl, O, Phosphorothioate, *USSR.

The effect of different concentrations (0.00001-2%) of emulsified Baytex (0,0-dimethyl 0-(4-methylthio)-m-tolyl) phosphorothioate) on representatives of Copepoda and Cladocera from the forest puddles in Karelia (Russian SFSR, USSR) was studied. For Copepoda (Mainly Acanthocyclops ssp.) concentrations of 0.1-2% were toxic; the numbers of Copepoda were reduced by 24 h after the water bodies treatment. For Cladocera (Daphnia pulex); almost all the experimental concentrations were lethal; death of Cladocera (100%) came within 2-3h. The minimum tested concentration of the insecticide was toxic for Cladocera; about 60% of the Cladocera died 24 h after the treatment. The efficiency of the preparation increased wiht the water temperature elevation.--Copyright 1975, Biological Abstracts, Inc.
W76-02899

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE REAERATION OF UNIFORM STREAMS,
Mississippi Univ., University. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-02934

CHANGE OF SOME PHYSIOLOGICAL AND BIOCHEMICAL INDICES OF PHRAGMITES COMMUNIS TRIN. WITH DIFFERENT MINERAL NUTRITION UNDER EXPERIMENTAL CONDITIONS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. I. Merezhko, K. B. Yakubovskii, and P. N. Shiyan.
Gidrobiol Zh, 10(3) 90-93, 1974.

Descriptors: *Nutrients, *Chlorophyll, Photosynthesis, Waste water treatments.
Identifiers: Biochemical conditions, Chlorophyll-b, Indices, *Mineral nutrition, *Phragmites-Communis, Physiological conditions, *Reeds.

The exclusion of N, P and K from the nutrient medium led to a decrease in chlorophyll a content in the common reed, P. communis. A decrease in chlorophyll b content occurred only on excluding N from the mixture. The photosynthetic intensity of the reed decreased with complete elimination of only K or N from the medium. The exclusion of N from the medium markedly (5-fold) reduced the reed phytomass increment. This indicates the possibility of using the reed for treating wastewaters rich in N compounds.--Copyright 1975, Biological Abstracts, Inc.
W76-02942

MACROFAUNA OF THE STONY BOTTOM OF LAKE GENEVA, (IN FRENCH),
C. Lang.
Schweiz Z Hydrol. 36(2): 301-350. Illus. 1974. (Engl. and Ger. summ.).

Descriptors: Lakes, *Eutrophication, *Benthic fauna, Lake beds, *Distribution patterns.
Identifiers: Erpobdella-Octoculata, Glossiphonia-Complanata, Helobdella-Stagnalis, *Lake Geneva, *Switzerland.

In Lake Geneva (Switzerland), the macrofauna of the story lake bottom was studied in 7 stations from 1969-1971. The modifications in animal communities since the beginning of the century can be attributed partly to the increasing eutrophication of the lake and partly to the introduction of new species. The stations are classified according to the structure of their animal communities, which allow the degree of eutrophication of each station to be deduced. The analysis of factors which influence the animals' microdistribution on lake-bottom stones reveals many complicated interactions. As a result of this complexity, further research projects were concentrated on leeches (Hirudinea) which colonize artificial substrates in imitation of the underface of stones. Helobdella stagnalis, Erpobdella octoculata and Glossiphonia complanata form the major part of collected fauna. Density fluctuations, population structures (age groups) and quantitative relations between these 3 spp. as well as their vertical and horizontal distribution patterns were examined in detail.--Copyright 1975, Biological Abstracts, Inc.
W76-02985

THE PELAGIC ROTATORIA OF THE SEMPACHERSEE WITH SPECIAL REGARD TO THE BRACHIONIDAE AND THE QUESTION OF NUTRITION, (IN GERMAN),
C. Zimmermann.
Schweiz Z Hydrol. 36(2): 205-300. Illus. 1974. (Fr. and Engl. Summ.).

Descriptors: Lakes, *Mesotrophy, *Rotifers, *Algae, *Reproduction, Chrysophyta, Nannoplankton, Nutrients, Eutrophication.
Identifiers: Brachionidae, Cryptophyceae, Erkenia-Subaequiciliata, Kellicottia-Longispina, Keratella-Chochlearis, Keratella-Quadrata, Sempachersee, *Switzerland(Lake Sempach).

The pelagic rotifers of mesotrophic Lake Sempach (Switzerland) were investigated qualitatively and quantitatively from 1969-71. The rotifer reproduction rate was highest from spring until early summer, with peaks of 0.86 million individuals below 1 dm2 in 1969 and 0.92 in 1970. During summer stratification, production was comparatively low. During both years Keratella cochlearis made up an average of 50% of the total number of rotifers. K. cochlearis, K. quadrata and Kellicottia longispina reproductive rates were calculated, using the egg ratio method of Edmondson. The highest yearly rates of the 3 spp. were noted in spring at a depth of 0-5 m. From spring until early summer in 1970, 88% of the biomass of the 1st large phytoplankton peak were nannoplankton, 70% of which consisted of Cryptophyceae and Chrysophyceae from the end of April until the middle of June. During the investigation of the 3 Brachionidae, inquiries into the food relation to nannoplankton algae showed close relations to these algae groups and more over to micro-algae. In spring the Chrysophyceae Erkenia subaequiciliata seems to be the most important food for the 3 rotifer species.--Copyright 1975, Biological Abstracts, Inc.
W76-02993

5D. Waste Treatment Processes

EFFECT OF GEOGRAPHICAL VARIATION ON PERFORMANCE OF RECIRCULATING COOLING PONDS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5B.
W76-02501

OPTIMIZING A PETROCHEMICAL WASTE BIO-OXIDATION SYSTEM THROUGH AUTOMATION,
Dow Chemical Col, Freeport, Tex. Texas Div.
M. A. Zeitoun, and N. J. Biscan.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/2-75-021, June 1975. 200 p, 62 fig, 18 tab, 61 ref, 4 append. EPA 1 BB 036. Grant No S 800 766.

Descriptors: *Waste water treatment, Pilot plants, Industrial wastes, Nutrients, Waste treatment, Treatment facilities, *Automation, *Activated sludge, Control systems, Recycling, Sludge treatment, Oxidation, Monitoring, Oil wastes, Organic wastes.
Identifiers: Biological Activity.

Systems were developed to control the critical parameters of the activated sludge process to achieve reliable, high quality effluent. An automated sampling system, sampling feed and homogenized mixed liquor, monitored the total carbon in both samples. Nutrients were added in propartion to the total carbon in the feed, thus maintaining low residual nutrients in the effluent. The sludge recycle flow rate was controlled by a food to microorganisms signal, measured as the ratio of total carbon in the feed to that in the mixed liquor. Toxic or inhibitory effects of the feed were measured by a Biological Inhibitor Detector, an instrument which measures the oxygen uptake of standard solutions before and after exposure of a bacteria sample to a feed sample and calculates an activity ratio. The use of the instrument as an upstream sensing device was demonstrated as toxic substances were added to the feed. The developed on-line control systems are applicable to municipal, industrial or combined treatment plants. (EPA)
W76-02503

PURIFICATION OF STRONGLY POLLUTED EFFLUENTS OF THE PULP INDUSTRY BY RANEY CATALYSTS (PRECHISTVANE NA SILNO ZAM'RSENI OTPAD'CHNI VODI OT TSELULOZNATA PROMISHLENOST CHREZ RANEI-KATALIZATORI),
Kh. Popov.
Trudove na Nauchno-Izsledovatelskiya Institut po Vodosnabdyavane Kanalizatsiya i Sanitarna Tekhinka, Vol 8, No 2, p 135-154, 1973. 1 fig, 27 ref, 2 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Sulfur compounds, Sulfides, Degradation(Decomposition), Cobalt, Nickel, Iron, Catalysts, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Water quality control, Water purification.
Identifiers: *Raney catalysts, Polysulfides, Methyl mercaptan, Dimethyl sulfide, Dimethyl disulfide, Bulgaria.

Results are described on experiments conducted with effluents from the Bulgarian Kiradzhiev kraft pulp mill containing up to 93.5 g/cu m sulfides and polysulfides, up to 779.7 g/cu m methyl mercaptan, up to 249.1 g/cu m dimethyl sulfide, and up to 207.1 g/cu m dimethyl disulfide. These sulfur compounds were degraded, using Raney nickel, Raney cobalt, and Raney iron as catalysts. At a contact time of 1 hr, a temperature of 33-66C, and a catalyst dose of 125-250 g/cu m, the removal of the different compounds ranged from 97% to over 98%. Raney iron gave a somewhat lower degree of purification than the two other catalysts, but its activity was enhanced more by higher temperature and higher dose. Because it is cheaper and more readily available, Raney iron is recommended for the technological process which was developed on the basis of laboratory results. The process is described and illustrated by a diagram. The catalyst can be reused 2-3 times, although its activity is reduced. For regeneration of the catalyst, the sludge containing it is burned, and the metal oxides formed are reduced, the metals being reused for alloying. The preparation of the Raney catalysts is described, and their reactions with the sulfur compounds are discussed. (Stapinski-IPC)
W76-02508

METABOLISM OF SINGLE-CARBON COMPOUNDS IN THE BIOLOGICAL PURIFICATION OF WASTE WATERS (METABOLIZM ODNOUGLERODNYKH SOEDINENII V PROTSESSE BIOLOGICHESKOI OCHISTKI STOCHNYKH VOD),
Voronezh State Univ., (USSR).
E. N. Makeeva, A. N. Makeev, and I. D. Rodziller.
Prikladnaya Biokhimiya i Mikrobiologiya, Vol 11, No 3, p 367-373, May/June, 1975. 1 fig, 14 ref, 3 tab. English summary.

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escriptors: *Biological treatment, *Waste water eatment, *Organic compounds, *Metabolism, Activated sludge, *Microorganisms, Aeration, xidation, Carbon dioxide, Water pollution urces, Carbon radioisotopes, Isotope studies, emical wastes, Alcohols, Organic acids.
entifiers: Formaldehyde, Methanol (Methyl alhol), Formic acid, Serine.

e machanism and kinetics of metabolism of carn-14 labeled formaldehyde, methanol, and forc acid by activated sludge microorganisms hich had been adapted to growing on substrates ntaining these compounds) were studied in odel aeration equipment of 8-liter capacity. Inidual compounds and their binary and ternary xtures were used as substrates for the activated dge. According to data obtained, formaldehyde netabolized in preference to the two other comnds. It is oxidized to carbon dioxide via forte and incorporated directly through primary thesis of serine. This reaction is intensified in presence of methanol. Oxidation of methanol carbon dioxide is inhibited in the presence of maldehyde or formate, while the rate of oxidan of formate is not affected by the presence of two other compounds. (Stapinski-IPC)
6-02514

OMASS -- A PRODUCT OF BIOLOGICAL PUTICATION OF PULPING EFFLUENTS AS ED FOR POULTRY (BIOMASA -- PRODUKT OLOGICKEHO CISTENI ODPADNICH VOD VYROBE CELULOZY -- JAKO KRMIVO O DRUBEZ),
earch Inst. of Veterinary Medicine, Brno echoslovakia).
primary bibliographic entry see Field 5E.
5-02515

LUENT CONTROL PLUS WATER AND ER RECOVERY.
cessing, vol 21, No 8, p 15, August, 1975. 1 fig.

criptors: *Waste water treatment, *Pulp es, Wates, Industrial wastes, Water pollution ces, Water pollution treatment, Suspended ds, Water reuse, Flocculation, Water conption(Except consumptive use), Water conation.
tifiers: Tissue mills, Fiber recovery, England.

effluent treatment plant at Bowater-Scott oration's tissue mill at Northfleet, Kent land) is divided into two self-contained treatsystems: 'clean' and 'dirty'. The water/fiber ures from the 3 paper machines are segregated all other forms of discharge and treated in the n' system when the long fibers are removed reening and the remaining solids removed by ulation. This water is reused in the paper mill. ent from the floor drains is treated in the ' system by flocculation to remove nded solids and discharged. This treatment m has reduced the solids content of the arge effluent and the consumption of fresh , and recovered valuable fiber. (Witt-IPC)
02517

IZATION OF ALUMIZED RED MUD DS (ARMS) FOR PHOSPHORUS OVAL,
rtment of the Environment, Ottawa rio). Wastewater Technology Centre.
Shannon, and K. I. Verghese.
dian Environmental Protection Service, ology Development Report EPS 4-WP-75-2, August, 1975. 3 fig, 4 ref, 4 tab.

iptors: *Phosphorus compounds, *Waste treatment, *Chemical precipitation, Coagu- Waste treatment, Water pollution treat- Water pollution sources, Separation ques, Pilot plants, Municipal wastes, emical oxygen demand, Suspended solids, Aluminum, Sulfates, Heavy metals, Sludge, Operating costs, Costs, Chemicals.
Identifiers: Aluminum compounds, Coagulants.

A new material with coagulant properties is produced by treating the waste product (red mud) from the Bayer aluminum manufacturing process with sulfuric acid and crushing the resulting dried product to a fine powder. The material has physical characteristics similar to pulverized lime and is referred to as alumized red mud solids (ARMS). ARMS has potential application in waste water treatment systems, particularly for phosphorus removal. Pilot plant experiments utilizing ARMS to treat a municipal waste water are described. BOD, suspended solids, and total phosphorus removal efficiencies obtained at an ARMS dosage of 200 mg/liter were comparable to removals obtained at common dosage levels of alum (aluminum sulfate), a traditional phosphorus precipitant. Heavy metal impurities in the ARMS accumulated in the primary sludge; this could be a problem if sludge disposal on land is selected as a disposal alternative. ARMS can be used in full scale phosphorus removal systems, resulting in chemical operating costs as much as 50% lower than comparable alum systems. (Witt-IPC)
W76-02520

HARDNESS REMOVAL BY ION EXCHANGE WITH A RECOVERABLE ORGANIC REGENERANT,
Purdue Univ., Lafayette, Ind.
G. V. Johnson.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No 75-17,217. PhD Thesis, 1974, 247 p.

Descriptors: *Ion exchange, *Effluents, *Waste water treatment, *Recycling, Sodium, Calcium compounds, Magnesium compounds, Hardness(Water), Organic compounds, Membrane processes, Water reuse.
Identifiers: *Glucosamines, Regenerants, Ultrafiltration.

Currently sodium cycle ion exchange regenerant effluents are discharged, without treatment, directly to sewer systems or natural waterways. Because these effluents contain excessive concentrations of dissolved solids, particularly calcium and magnesium, it is expected that such discharge will soon be prohibited under the Federal Water Pollution Control Act. Alternative disposal methods or removal of hardness-causing ions were investigated, particularly the possibility of a water softening process involving regenerant reuse. The treatment system consisted of removing hardness-causing ions by ion exchange, using glucosamine as a recoverable organic regenerant, and subsequently concentrating the eluted glucosamine for reuse by means of an ultrafiltration membrane system. Calcium and magnesium were exchanged on a cation exchange resin in a glucosamine cycle, and an effluent with a glucosamine concentration of 3000-3500 mg/liter, initial breakthrough volume of 2000 ml, and initial specific treatment capacity of 650 gal/cu ft of resin was produced. A confirmation process for cyclic reuse of the glucosamine regenerant was performed, with the use of a membrane recovered glucosamine concentrate to regenerate the ion exchange column. A net result of achieving the same degree of regeneration previously attained with the unused glucosamine was found. (Kramer-FIRL)
W76-02561

WATER QUALITY MANAGEMENT PLANNING FOR THE ROARING FORK RIVER BASIN IN WESTERN COLORADO,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5G.
W76-02563

GROWTH KINETICS OF HETEROGENEOUS MICROBIAL POPULATIONS AND THE MODELLING OF BIOLOGICAL WASTE TREATMENT REACTORS,
Toronto Univ. (Ontario).
C. P. Michellepis.
Available from National Library of Canada, Ottawa. Ph.D. Thesis, 1973.

Descriptors: *Activated sludge, *Mathematical models, Temperature, Microorganisms, Growth rates, Kinetics, Biomass, Biological treatment, *Waste water treatment, Monitoring.
Identifiers: Fujimoto equation, Food to microorganism ratio, Solids retention time, Bench-scale studies.

A study was performed to ascertain whether, at constant temperature, the growth parameters of heterogenous populations in the activated sludge process are determined solely by the composition of the waste or whether they are also a function of solids retention time (SRT). Mathematical models assume that these parameters are true constants. Bench-scale activated sludge units were operated, of the continuous-flow, completely-mixed type. Various rates of dilution, recirculation and cell wastage were compared, with and without cell recycle. During these growth studies, the increase in biomass, carbon uptake, and oxygen uptake were monitored. Results showed rapid 'initial' uptakes of organic carbon and increases in optical density which had no apparent effect on oxygen uptake. The apparent biomass yield was found to be a function of solids retention time, but the 'true' biomass yield coefficient was independent of SRT. Data were well correlated by a relationship between specific growth rate and the food:microorganism ratio proposed by Fujimoto. The maximum specific growth rate was strongly correlated with the net specific growth rate of the continuous flow cultures. It was concluded that the growth parameters of heterogeneous populations which operate under one set of conditions should not be used for the prediction of process performance under different operating conditions. A mathematical model for a completely-mixed biological reactor was developed, based on the growth equation of Fujimoto. In batch studies, there was a reasonable agreement between the expected and observed biomass concentrations and observed substrate concentrations were lower than predicted ones. (Kramer-FIRL)
W76-02566

AQUEOUS COMPLEXATION OF COPPER WITH SEWAGE AND NATURALLY OCCURRING ORGANICS,
Michigan Univ., Ann Arbor.
B. R. Culp.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 75-20,324. Ph.D. Thesis, 1975, 128 p.

Descriptors: *Heavy metals, *Pollution identification, *Copper, *Analytical techniques, *Sewage effluents, Toxicity, Environmental effects, Municipal wastes, Industrial wastes, Treatment facilities, Chromatography, Molecular structure, Chemical oxygen demand.
Identifiers: Gel chromatography.

Heavy metal distribution and speciation in natural and waste water was investigated. Copper was selected as a heavy metal typically found in both municipal and industrial waste effluents. Experiments were conducted to determine the interaction of copper with inorganic and organic complexing ligands found in sewage and in receiving waters. Differential pulse anodic stripping voltammetry was used for an assessment of the metal-organic binding capacity of copper in sewage and processes effluents. This capacity was measured for effluents from four sewage treatment plants in Washtenaw County, Michigan. The organic content of the sewage (as quantified by TOC, COD,and BOD) was found to affect the degree of

complexation. Data suggested that the chemical parameters of TOC and COD might be used to predict binding capacity from one plant to another. Samples of raw influent and final effluent sewage were freeze-concentrated and fractionated by gel chromatography; molecular weight fractions suggested that copper binding is dependent on the degree of biodegradability of the organic material. With new methodologies for assessing metal distribution and speciation, it is suggested that heavy metal characterization in terms of degree and type of their complex formation, can be used to predict the availability of metal micronutrients and toxicity of metals to the environment. (Kramer-FIRL)
W76-02570

GULF STATES INSTALLS EFFLUENT TREATMENT, COLOR REMOVAL PLANT.
Paper Trade Journal, Vol 159, No 22, p 41-42, 44, September 15, 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Treatment facilities, Suspended solids, Oxidation, Lagoons, Color, Sludge treatment, Dewatering, Costs, Operating costs, Activated sludge, Alabama.
Identifiers: UNOX, Filter presses, Clarification.

The Gulf States Paper Corporation's plant in Tuscaloosa, Alabama, built in 1928, is located on a lake 8.5 miles long formed by the Black Warrior River. New effluent and emission control laws have required the plant to greatly upgrade its treatment. The present system, which exceeds the goals of the EPA 1983 standards, includes: pumping mill effluent half a mile to a primary clarifier where the suspended solids are settled; bio-oxidizing effluent from the clarifier in a 4-stage UNOX activated sludge system to remove 86-90 percent of the BOD; decolorizing the UNOX stage effluent by reacting with alum-silica slurry; and, clarifying the treated effluent to remove the organic precipitate. The final effluent is discharged to a holding lagoon with a 10 day effluent flow capacity. Sludges from the primary and UNOX clarifiers and the decolorization stage are combined and dewatered in a Beloit-Passavant filter press. The dewatered sludge is incinerated in a multi-hearth Nichols Herreshoff furnace. Total cost of the project was about $7.6 million. The treatment plant can handle effluent flows of 14 mgd at a mill production of 750 tpd. Based on an average of 12,000 lbs BOD 5/day, the annual operating costs are $151,97/million gal of effluent. (Orr-FIRL)
W76-02571

SCOTTISH MILL TESTS RECOVERY SYSTEM.
Paper, Vol 184, No 4, p 202, August 18, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Equipment, Fibers, Recycling, Filtration, Suspended solids, Water reuse, Fiber(Plant).
Identifiers: Scotland.

A test program performed at a paper mill in the Aberdeenshire area of Scotland demonstrated the ability of the Mecatec Effluent Treatment System to recover fiber. The Mecatec Effluent Treatment System is a multi-purpose low-cost modular unit developed in the United Kingdom. It has been successfully used for general and industrial waste water treatment. The system has no moving parts and combines features of inertial and blanket filtration for the effective removal of particles. In addition to recovering fibers, the system recovers china clay and chalks. The trial run at the Aberdeenshire plant showed impressive separation of thick and thin fractions. With an input of about 14,000 gph, the overall clarification efficiency was between 85 and 95 percent. The clarified overflow, with an average of 140 ppm total solids, was used as shower water. The thickened underflow was returned to a saveall unit achieving a 400 percent increase in saveall drum efficiency. The recycled water resulted in a 50 percent reduction in mains intake. The fiber recovered should pay for the cost of the system in several months. (Orr-FIRL)
W76-02573

COMPLEX CHEMISTRY IN WASTE WATER TECHNOLOGY (KOMPLEXCHEMIE IN DER ABWASSERTECHNIK),
L. Hartinger.
Vom Wasser, Vol 44, p 69-117, 1975. 15 fig, 23 tab, 25 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Heavy metals, Chemical precipitation, Chemical reactions.
Identifiers: *Metal complexing agents, Complex chemistry.

One of the main problems encountered in the treatment of metal industry effluents is the presence of complexing agents in the waste streams. These complexing agents form compounds with heavy metals preventing precipitation of metal hydroxides during neutralization. The important considerations in the treatment of waste waters containing complexing agents are summarized. The most important rules of complex chemistry are presented as background material. In addition, the structures and stability constants of common complexing agents with metals are shown. Finally, some references for the treatment of metal complex solutions by precipitation, reduction and oxidation are given. (Orr-FIRL)
W76-02574

HYDROCHLORIC ACID EFFLUENT TREATMENT.
French Patent FR 2250-711. Issued July 11, 1975. French Patents Abstracts, Vol W, No 35, p D3, October 7, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Metals, Neutralization, Lime, Recycling, Byproducts.
Identifiers: Hydrochloric acid, Sulfuric acid.

A patent has been issued for a method of treating industrial effluents containing hydrochloric acid from metal rinsing baths. The effluents stream following the pickling operation, before hotdip galvanizing, is first neutralized with lime. Sulfuric acid is added to the resulting CaC12 solution to produce CaSO4 and a very dilute HC1 solution. The hydrochloric acid solution is recycled into the process cycle. The treatment method eliminates the formation of effluents with high salts content, such as CaC12 and NaC1, which are difficult to treat and cause serious pollution. The byproducts of treatment can be sold for use in paper manufacturing. (Orr-FIRL)
W76-02575

WASTE WATER TREATMENT.
Steel Times, Vol 203, No 9, p 788, September, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Steel, Metals, Separation techniques, Equipment, Flocculation, Water reuse, Dewatering.
Identifiers: *Magnetic separation, Magnadisc process.

The Magnadisc water treatment system is based on the magnetic separation of solid particles from polluted water. The process is especially suited to the treatment of effluents from steel works. Non-magnetic materials can also be removed by the process. The system contains many stainless steel magnetic discs each containing a large number of permanent magnets. These discs rotate slowly against the direction of water flow; magnetic particles are attracted to the disc surfaces. The discs continue to rotate carrying the particles to a position where endless rubber belts scrape the parti cles off the discs and transport them to a disposa chute. The complete system also incorporates flocculation tank to assist in the removal of non magnetic particles. An added flocculant causes th magnetic and non-magnetic particles for form magnetic flocs, which are then captured by th disc filter. Filter units are available with 5 to 3 discs, to deal with flows from 75 to 450 cu m/h Larger water flows are treated by increasing th number of filter units. The equipment has satisfac torily treated the effluent from the Storfors Steel works, Sweden. The cleaned water at Storfors i recycled. The magnadisc system is very compact the moving parts are few and slow-moving; an some dewatering of the sludge occurs as it move with the discs. (Orr-FIRL)
W76-02576

REMOVAL OF HEAVY METALS FROM WASTEWATER BY FERRITE COPRECIPITATION,
Nippon Electric Co., Ltd., Kawasaki (Japan). Central Research Lab.
T. Okuda, I. Sugano, and T. Tsuji.
Filtration and Separation, Vol 12, No 5, p 472, 475 476, 478, September/October, 1975. 3 fig, 4 ref, plates.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Heavy metals, *Chemical precipitation, Byproducts, Recycling, Iron.
Identifiers: *Ferrite, Magnetic properties, Japan.

A process has been developed for removing heavy metals from waste waters by converting them to ferrite precipitates with spinel structures and ferromagnetism properties. The formation of ferrite containing heavy metals requires a divalent ferrous salt, such as ferrous sulfates found in industrial wastes from steel and titanium oxide productions. Therefore, one industrial waste can be used to treat other industrial wastes. The process allows the simultaneous treatment of many kinds of heavy metal ions. The precipitates have high stability against redissolution, and can be removed magnetically, or by filtration. The final precipitate, ferrite, is an immediately usable ferrite-ferromagnetic product which can be used for ferrofluid and microwave absorption sheet. The process was tested with waste water discharged from Nippon Electric Company's Central Research Laboratories, Kawasaki, Japan. The effluent showed a degree of pollutant removal which cannot be achieved by conventional methods. The process has also been used for treating the effluent from the scrubbing tower for stack gas which is exhausted in incinerating municipal waste. All of the heavy metals contained in this effluent were converted to ferrite. (Orr-FIRL)
W76-02577

ADSORBENTS WIN HEAVY METALS FROM PROCESS STREAMS AND WASTES.
Chemical Engineering, Vol 82, No 20, p 49-50, September 29, 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Heavy metals, Adsorption, Separation techniques.

The ALM Series of adsorbents and fixatives is the latest winner of Japan's Society of Synthetic Organic Chemistry's highest award for pollution control advances. The commercially proven, high-polymer products contain sulfur and nitrogen functional groups with high affinites for heavy metals. The products can reduce metal levels in effluents from 20-30 ppm to less than one ppm. The compounds are a superior alternative to heavy metals removal techniques such as alkali precipitation, ion exchange, and activated carbon adsorption. The compounds are useful in the following processes: mining; nonferrous metals production; photographic and battery cell plants; pigments and dyes facilities; sewage treatment plants; PVC

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nanufacturing; pharmaceuticals and final chemi-
als production; and other chemical operations.
ALM-525 will adsorb cadmium, mercury, copper,
ead, zinc, chromium, arsenic, nickel, and cobalt.
ALM-125 can absorb up to 680 g of Hg/kg in aque-
us solution and up to 340 g Hg/kg in 10% sulfuric
cid solutions. ALM-648 can be used to fix sludge
nd soil; ALM-668 will fix organic mercury; and
ALM-618 will fix sediment sludges. (Orr-FIRL)
V76-02578

**ANGE OF PRODUCTS TO REDUCE OIL EF-
LUENT LEVELS ANNOUNCED.**
ustralian Chemical Engineering, Vol 16, No 6, p
4, June, 1975.

escriptors: *Waste water treatment, *Industrial
astes, *Oil industry, Oily water, Separation
chniques, Equipment, Filtration, Adsorption,
ustralia.

full range of products to reduce oil levels in ef-
uents is offered by Tecalemit Pty. Limited of
ustralia. The products all use CDA which is a
odified form of ures formaldehyde with unique
l absorbing properties. Tecflake and Tecblock
e CDA foam in flaked or solid form to be used in
eating small oil spills, or floated in existing inter-
ptor traps to assist oil or grease removal. The
aterial is also an efficient hand cleaner with
nollient properties. CDA Strainers are per-
anently installed in existing interceptor traps. All
fluent discharged must pass through these
ainers ensuring the removal of oil and grease.
DA filters are installed in more sophisticated in-
rceptors. They provide a final polishing action
the effluent, achieving effluents with a
drocarbon contamination of less than 5 ppm.
rr-FIRL)
76-02579

**MMONIA AND HYDROGEN SULPHIDE
COVERY.**
therlands Patents NL 146-461. Issued July 15,
75. Derwent Netherlands Patents Report, Vol
No 33, p D2, September 23, 1975.

scriptors: *Waste water treatment, *Industrial
stes, *Liquid wastes, Oil industry, Ammonia,
drogen sulfide, Patents.
ntifiers: Sour water stripping, Distillation
umns, Refinery wastes energy.

method for the recovery of ammonia and
drogen sulfide from liquid effluents has been
ented. Ammonia and H2S are separated from
aqueous solution by stripping in a first distilla-
column at high pressure and low temperature.
e H2S vapor is removed from the top of the
umn, and the bottom aqueous product contains
e NH3 and H2S. The bottom product is
pped in a second column, producing an aque-
effluent with considerably less NH3 and H2S,
a top product with a high concentration of
3. The vapor containing a high level of NH3 is
ially condensed at a lower temperature than
in the top of the column and most of the con-
sate obtained is recycled to the top of the
nd column. The NH3 concentration of the top
r stream is increased by condensing water, so
the vapor obtained consists mainly of NH3.
noncondensed fraction contains the H2S and
water separated from the NH3, and the NH3
vered. The non-condensed fraction is recycled
e column. The small fraction obtained from
op of the second column after condensation is
cled to the first distillation column. (Orr-
L)
-02580

SE SOUR WATER STRIPPER BOTTOMS,
Lab., Inc., Trevose, Pa.
. Maguire.
rocarbon Processing, Vol 54, No 9, p 151-152,
ember, 1975. 1 fig, 1 tab, 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Hydrogen sulfide, Ammonia, Water reuse, Recycling.
Identifiers: Sour water strippers, Distillation columns, Refinery wastes.

Sour water strippers are used to remove most of the sulfide and ammonia from refinery process waters. Sour water stripper bottoms (SWSB) are essentially distilled water and can be reused as desalter water, process wash water, cooling tower make up and/or boiler water makeup. SWSB are ideal desalter water if the hydrogen sulfide and ammonia are properly removed. Problems with use as desalter water include changing ammonia concentrations, cyanides which will transfer to the oil phase in a desalter, and the formation of ammonium naphthenate soaps due to an incorrect pH. SWSB have been used as process wash waters in catalytic cracker spray systems and overhead condensers for FCC main column and crude units with very few problems. The results of using SWSB as cooling tower makeup normally depend on stripper efficiency, cooling water treatment, and controls. Reuse of SWSB as boiler makeup depends on the existing external treatment equipment. Problems with this use include corrosion and deposition of sulfides, heat transfer and under-deposit corrosion attack from iron sulfide, ion exchange resin fouling and boiler foaming and carryover from oil contaminants in the stripper bottom, and ammonium bicarbonate deposits from the presence of ammonia. (Orr-FIRL)
W76-02582

COMPACT, LOW-COST INDUSTRIAL FILTER FROM PERMUTIT.
Australian Chemical Engineering, Vol 16, No 6, p 16, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical industry, Metals, Food processing industry, *Filtration, *Filters, Equipment, Australia.

A new compact industrial tubular filter which provides high efficiency filtration at low cost has been developed by the Permutit Company of Australia Pty. Limited. The filter, Tubular Type 123, is designed for use with liquids used in the chemical, plating and food processing industries. It is suitable for polishing of corrosive or non-corrosive liquids containing a low percentage of solids, and can also be used as a trap filter together with other clarification equipment for the removal of fines. The unit consists of a number of perforated metal tubes inside a carbon steel, steel with rubber liner, or stainless steel shell and cover. Flat sheets of filter material, sometimes coated with diatomaceous earth, are rolled and inserted into the tubes. The unit may be cleaned by replacing the filter paper liners. A full range of sizes containing from one to 82 tubes and having filtration areas of 2.4 sq ft to 196.8 sq ft are offered. The units are available complete with pumping equipment or modified to be installed in existing process lines. (Orr-FIRL)
W76-02584

PURIFICATION OF WASTE WATERS CONTAMINATED WITH METHANOL (EPURAREA APELOR REZIDUALE IMPURIFICATE CU METANOL),
M. Balan, E. Dacin, and M. Manea.
Revista de Chimie, Vol 26, No 6, p 502-506, June, 1975. 6 fig, 8 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Methanol, Biological treatment, Biological treatment.
Identifiers: Physical treatment, Chemical treatment.

A study was performed on the use of physical, chemical, and biological techniques for the treatment of residual waters contaminated with methanol. The results obtained by each treatment method are presented. Good efficiency in treating methanol contaminated waters by biological means is achieved only up to a concentration of 300 mg/liter. (Orr-FIRL)
W76-02585

EFFLUENT YIELDS GYPSUM AND PURE WATER AT CYANAMID'S T102 PLANT,
A. Banov.
American Paint and Coatings Journal, Vol 60, No 12, p 20-21, 24-25, October 6, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Waste water disposal, Water reuse, Neutralization, Georgia.
Identifiers: *Gypsum, Magma.

Waste water disposal restrictions forced the Savannah, Georgia, titanium dioxide plant of American Cyanamid to spend about $20 million to convert their effluent into gypsum and pure water. Three types of acid wastes come from the plant: a concentrated stream containing about 20 percent sulfuric acid from the production stage where titanium hydrate is precipitated; weak acid from the tanks where titanium hydrolysate is washed free of impurities; and, cooling waters used in contact coolers. The strong acid goes to a pond lined with an impermeable Hypalon membrane with a working capacity of 200,000 gal, about one day's off-load of spent liquor. Reserve capacity can handle 15 days output. The acid is fed to neutralization reactors, where limestone is added to form carbon dioxide gas, which will be sold, and a slurry of almost pure gypsum. The remaining acid and dissolved salts are separated by settling and filtration and are passed to a final neutralization reactor where the waste is neutralized with slaked lime and the metals are precipitated as insolvent hydroxides. The combined gypdum-metal hydroxides and water are pumped to a two million gal settling tank. Cleaned water is reused in the plant. The gypsum-iron slurry, or magma, settles to the bottom of the tank and is pumped to a filtration system. The filtered water is combined with the cooling water in an effluent settling pond. Effluent from the pond overflows a dam through a metering device into the Savannah River. (Orr-FIRL)
W76-02586

SILVER RECOVERY DEVICE FOR PHOTO FIXER SOLUTIONS,
R. J. Cooper, and V. V. Carnell.
Canadian Patent 973,833. Issued September 2, 1975. The Patent Office Record, Vol 103, No 35, p 40, September 2, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Patents, Equipment, Silver, Cathodes, Anodes.
Identifiers: Photographic solutions.

A silver recovery device for the purification of photographic fixer solutions has been patented. A plastic cylindrical container with a removable top lid is adapted to receive a quantity of used photographic solutions. An anode strip is positioned in a spiral configuration adjacent to the inside walls of the container. The many turns of the anode strip decrease in axial spacing from top to bottom along the container walls. A cathode in the form of a flexible blade is suspended from the center of the container cover and extends along the full height of the container. A direct current power supply is connected to the anode through the top container wall and to the cathode through the container cover. Recovered silver is removed from the cathode by slightly flexing the blade surfaces. (Orr-FIRL)
W76-02587

LIQUID WASTE INCINERATION BY BALFOUR/NITTETU SYSTEM SOLVES EFFLUENT

PROBLEMS, CAN PAY FOR ITSELF OR EVEN TURN WASTE INTO PROFIT.
For primary bibliographic entry see Field 5E.
W76-02591

HARGREAVES CLEARWASTE TREATMENT CENTRE, WAKEFIELD.
Solid Wastes, Vol LXV, No 10, p 517-518, October, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Incineration, Ultimate disposal, Sludge disposal, Waste water disposal, Chemical wastes, *Treatment facilities.
Identifiers: Great Britain.

The Clearwaste Treatment Plant, commissioned and operated by the Hargreaves Group, Great Britain, was officially opened on July 23, 1975. The center is designed to dispose of toxic liquid wastes from industrial processes. Liquid wastes are rendered non-toxic by chemical treatment, resulting in settled sludges and clear non-toxic liquor. Final disposal of the sludge is incineration; the liquor is sent to the sewer. Pickling acids, waste acids, electro-plating solutions and alkali wastes are treated in this section. Incineration at 1200 C is used to detoxify waste solvents, waste and contaminated hydrocarbon oils, cutting oils, oil/water emulsions, tank cleaning residues and metal sludges. The storage capacity of the center is 90,000 gallons. Many of the storage tanks have resistant linings and will contain effluents to be treated, high C.V. wastes, low C.V. wastes and aqueous sludges. The center uses the Burdon system of effluent treatment which consists of dilution, reaction, separation and consolidation tanks. The process is semi-automatically controlled through a centrally-located control panel. Incineration is accomplished in a two-stage Peabody Holmes incinerator. (Orr-FIRL)
W76-02592

REACTOR FOR NEUTRALISING EFFLUENT.
Netherlands Patent NL 7317-740. Issued July 1, 1975. Derwent Netherlands Patents Report, Vol W, No 29, p J3, August 26, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Neutralization, *Patents, Equipment.

A reactor for neutralizing effluent has been patented. The reactor consists of two parts, the lower part tapers towards the bottom where it joins an outlet. A reagent stream is fed tangentially at the top of the vessel and forms a film which moves downwards on a spiral path. A second reagent is sprayed at right angles to the first film. The reactor is small, simple, rugged, and reliable. Other advantages include no internal moving parts, low energy requirements, and continuous operation with a high through-put. (Orr-FIRL)
W76-02593

HEAT TREATMENT OF WASTE SLUDGES,
Chicago Bridge and Iron Co., Oak Brook, Ill. (Assignee).
J. D. Paccione, and D. M. O'Meara.
U.S. Patent No 3,913,500, 6 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1237, October 21, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Water quality control, *Sludges, Industrial waste, Dewatering, Heat exchangers, Incineration, Waste disposal, Ultimate disposal.
Identifiers: Fluidized-bed reactor.

The invention involves the thermal conditioning of waste sludge by passing sludge, in heat exchange relationship, through the reaction zone of a fluidized-bed reactor, where the sludge is rapidly heated to the temperature required for thermal conditioning. In addition to facilitating the thermal conditioning of the sludge, the exchange of heat abstracts heat from the fluidized-bed reaction zone, which increases the capacity of the incinerator. After the desired conditioning the sludge is de watered to produce an autogenous or supra-autogenous material which is incinerated in the fluidized-bed reactor without the addition of auxiliary fuel. The excess thermal energy can be used in heating the waste slurry which is to be thermally conditioned. In order to provide sufficient oxygen for the combustion of the increased amount of sludge, oxygen-enriched air or higher density bed material is used in the fluidized bed. (Sinha-OEIS)
W76-02597

SMALL BOAT OIL REMOVAL SYSTEM FOR BILGE WATER,
V. S. Pedone.
U.S. Patent No 3,913,513, 8 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1241, October 21, 1975.

Descriptors: *Patents, *Oil pollution, Water pollution control, *Filtration, *Oily water, Resins, Filters, Flow, *Waste water treatment.
Identifiers: Bilge water.

This patent describes a filtering system for removing small quanties of oil from water, particularly for use with small boats, although it may be used for other installations, such as industrial installation and swimming pool filter systems. The filter is provided with alternate layers of large particle expanded resin material and small particle expanded resin material. With a combination of large and small particles, it has been found that the large particles will permit the dispersion of the flow transverse to the general flow direction for distributing the flow, while the layer of small particles will satisfactorily remove the oil from the flowing water and be of a length in the direction of flow short enough to prevent channeling. The synthetic resin material that is chosen for the particles is preferably expanded polyurathane that will pick up between 50 and 70 times its weight in oil, without materially changing in size. With the material being tightly confined within a filter unit to prevent channeling, this ability to maintain its particle orientation and size while picking up oil is extremely important. A visual indicator is provided at the discharge end of the system to show when the filter should be replaced. (Sinha-OEIS)
W76-02598

SYSTEM AND PROCESS FOR BACTERIAL REDUCTION OF WASTES,
J. M. Clark.
U.S. Patent No 3,914,164, 9 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1458, Ocotober 21, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Septic tanks, *Water pollution control, Water quality control, Soil disposal fields, Anaerobic bacteria, Biodegradation, Oxygenation, Protozoa.

An optimum environment is provided for the rapid and complete treatment of organically decomposable matter. Precisely size-controlled bubbles of oxygen and other gases gently mix a solution of waste with bacteria and oxygen in such a fashion that large numbers of protozoa and other higher life forms are available to graze upon aerobic microorganisms and enteric bacteria. Subsequent to this treatment, the treated effluent is subject to quiescence and clarification. The effluent is then low in biochemical oxygen demand and almost totally free of suspended and settleable solids, and enteric bacteria, and is suitable for discharge in receiving streams, ground, water, or upon the land. Aerobic conditions are promoted in both a septic tank extender unit as well as in the drain field. Electrolysis is used at a sufficiently reduced voltage so that bubble sizes are in a range from 100 to 800 microns (which range of sizes affords a gentle mixing function). Pure oxygen and hydrog are produced, providing hydrogen acceptors f aerobic microorganisms, with the resultant i proved quality of the effluent (Sinha-OEIS)
W76-02599

METHOD AND APPARATUS OF TREATIN INDUSTRIAL WASTE LIQUID,
Matsushita Electric Industrial Co Ltd , Kador (Japan). (Assignee).
T. Sakagami, S. Kakumoto, K. Okawa, and K. Miyashita.
U.S. Patent No 3,915,691, 3 p, 1 fig, 6 ref; Offic Gazette of the United States Patent Office, V 939, No 4, p 2047, October 28, 1975.

Descriptors: *Patents, *Industrial waste, *Wa water treatment, *Chemical wastes, Hea metals, Mixing, Chemical reactions, Evaporatic Burning, Equipment, Liquid wastes.
Identifiers: Rare earth elements, High-molecu weight film, Color cathode ray tube manufacti ing.

The method of treating an industrial waste liqu containing heavy metals formed in the process manufacturing color cathode ray tubes consists mixing an aqueous waste liquid containing metal powders selected from the group consisting powders of metals, metallic compounds and m tures thereof with a water-soluble high molecul weight compound selected from the group consi ing of polyvinyl alcohol, methol cellulose, carbo methyl cellulose, sodium alginate and sodium c lulose xanthogenate to form a liquid mixtu transferring the liquid mixture into a movable b to spread it over the surface of the belt; subjecti the liquid mixture to temperatures between 1 deg C and 300 deg C to evaporate the water in t liquid and to concentrate the mixture; and cooli the concentrated mixture to form a solid film the high molecular weight film-forming organ compound. The film contains the metallic powde embedded in the solidified organic high molecul weight film. The high-molecular compound fil enables easy handling, storing and carryin Reclaiming the metals from the concentrated co pound can be made by burning the organic co pound to leave the metals as residue. The trea ment process produces no by-products exce water vapors and there is no risk of salts or u reacted metals and added bases being dissolv and coming out. (Sinha-OEIS)
W76-02603

PROCESS OF PURIFYING WASTE WATER B ELECTROLYSIS,
Nippon Risui Kagaku Kenkyusho (Japar (Assignee).
T. Ito, and H. Yamazaki.
U. S. Patent No 3,915,820, 3 p, 6 ref; Offici Gazette of the United States Patent Office, V 939, No 4, p 2081, October 28, 1975.

Descriptors: *Patents, *Waste water treatmen *Industrial wastes, *Water purificatio *Electrolysis, Anodes, Cathodes, Chemic wastes, Dyes, Hydrogen ion concentration.

Waste water containing dye stuffs is purified b carrying out electrolysis in two steps. The electro ysis is characterized in that an iron anode and a aluminum or aluminum base alloy cathode a used at a pH of lower than 7 of the waste wate and an iron and a carbon cathode are used at a p of higher than 7 of the waste water, and the ele trolysis of the waste water is carried out in tw steps at two different pH ranges of the was water. The hydrogen ion concentration (pH) of th waste water to be purified is adjusted to about when it is alkaline. An iron anode and an aluminu or aluminum base alloy cathode are dipped into th waste water and electrolysis is carried out by ap plying a DC voltage to the electrodes. As the elec trolysis is continued with stirring, the pH goes u and a precipitate is formed. When the pH reache

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about 7, the electrolysis is stopped. The precipitate is removed by filtration. An iron anode and a carbon cathode are dipped into the precipitate-removed waste water and the second step of electrolysis is carried out by applying a DC voltage to the electrodes in the same manner. As the electrolysis is continued with stirring, a precipitate is formed and th pH goes up. When the pH reaches about 11, the electrolysis is stopped and the precipitate formed is removed to obtain the purified water. (Sinha-OEIS)
W76-02604

SEWAGE TREATMENT,
E. Luck.
U.S. Patent No 3,915,853, 7 p, 12 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2090, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, Sewage treatment, Water pollution control, Water quality control, Filtration, Precipitation, Enzymes, Microorganisms, Biodegradation, Neutralization, Hydrogen ion concentration.

A method of treating liquid sewage includes precipitating heavy metals from the sewage, which may have been previously settled, filtered or otherwise treated so as to remove a large proportion of the solids content. The pH of the sewage is raised to over 11 and prefereably over 12, to destroy pathogenic organisms and to release enzymes from bacteria in the sewage. Nest the pH is lowered so that it is in a range in which the enzymes digest components of the sewage. Seed bacterial, fungal or yeast organisms or a mixture are added to the sewage to assist in decomposing organic components. After substantial decomposition the sewage is acidified to kill the organisms developed from those seeded, the dead organisms and other insoluble materials are removed and finally the remaining liquid is neutralized. (Sinha-OEIS)
W76-02605

WASTEWATER TREATMENT,
Autotrol Corp., Milwaukie, Wis. (assignee)
J. N. Torpey.
U. S. Patent No 3,915,854, 6 p, 8 fig, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2090, October 28, 1975.

Descriptors: *Sewage treatment, *Patents, *Waste water treatment, *Domestic wastes, Water pollution control, Water quality control, *Biological treatment, Slime, Activated sludge, Oxidation, Trickling filters, Ammonia.

A process and apparatus is provided for simultaneously oxidizing carbonaceous matter and ammonia in wastewater. The process utilizes partially submerged rotating biological contactors such as discs, arranged in a single treatment state. By utilizing a single state of treatment and by control of the rate of feeding of wastewater to the slimes, the same surface is used to support both carbon and nitrogen utilizing organisms for their nutrition. The surface requirements for the critically loaded single stage unit has been shown to be determined by the nitrogenous oxidation requirements and no added surface need be supplied for the oxidation of carbonaceous matter. The oxidation of ammonia-nitrogen is carried out by specific organisms forming attached slimes whose efficiency is not limited by their metabolism. To accomplish a high degree of ammonia removal continuously, a settling tank should be provided after primary treatment that is large enough to absorb or dampen peak flow and polutant concentration surges entering the plant. The single stage biological contactor treatment unit is integrated into existing activated sludge and trickling filter secondary treatment plants to utilize existing capital equipment to a maximum degree. (Sinka-OEIS)
W76-02606

METHOD AND APPARATUS FOR CONSERVING WATER,
W. O. Olson.
U.S. Patent No 3,915,857, 5 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2091, October 28, 1975.

Descriptors: *Patents, *Water reuse, *Water utilization, *Waste water treatment, *Water conservation, Water treatment, Filtration, Activated carbon, Domestic wastes.
Identifiers: 'White' water.

A process for conserving water in household systems is described. Waste waters from the non-sanitary and low-dissolved solids generating components of the system are accumulated and pooled. These waters are considered 'white water' and are effluents from laundry facilities, bath, shower, and wash basin. A closed loop recirculation of the accumulated waste water is established through a filter medium comprising of activated carbon for a time sufficient to remove substantially all undissolved solids and at least a portion of the dissolved solids. The filtered and clarified water is diverted from the closed-loop recirculation and accumulated to resupply the household water system.(Sinha-OEIS)
W76-02607

APPARATUS FOR THE TREATMENT OF WATER SOLUTIONS BY ION EXCHANGE,
Hager and Elsaesser, Stuttgart-Vaihingen (West Germany). (Assignee).
K. P. Marquardt.
U. S. Patent No 3,915,861, 7 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2092, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, *Desalination, *Water purification, *Water softening, *Ion exchange, Water pollution control, Water quality control, Separation techniques, Equipment.
Identifiers: Regeneration.

A system is described for the treatment of water solutions by means of ion exchange masses, where the ion exchange masses through which the solutions flow are conducted in charges cyclically from a treatment container to a regeneration-and-wash column and in circulation are returned to the treatment container. The apparatus is comprised of a backrinse container, a regeneration-and-wash column and a treatment container. After leaving the liquid treatment container and before entering the regenerating-and-wash column, the ion exchange masses are back-rinsed in a back-rinse container. The ion exchange mass is transported from the regenerating-and-wash column by means of an immersion tube at the top of the regenerating-and-wash column, the depth of immersion of the immersion tube being adjustable according to the volume in the bottom funnel of the treatment container. Consequently the ion exchange mass in the head of the regenerating-and-wash-column which has been transported from the treatment container corresponds to the volume transported from the bottom funnel. (Sinha-OEIS)
W76-02609

SUBMERGED AIR RELEASE DEVICE PARTICULARLY FOR SEWAGE TREATMENT,
Envirex, Inc., Waukesha, Wis. (Assignee).
J. I. Moloney.
U. S. Patent No 3,915,862, 5 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2093, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, *Aeration, Aerobic treatment, Oxygenation, Diffusion.
Identifiers: Diffusers.

A corrosion-resistant, molded or cast diffuser body is directly attachable to a header provided with a plain round opening for a gas connection. The diffuser body snaps over the round header to secure it. The header with a number of diffusers attached is located in the tank so that the circulatory motion within the tank keeps the liquid within the lower open 'leg' of each diffuser in motion to prevent the liquid contents from accreting on and closing the diffusers. The diffuser is of a clean or entirely plain configuration and may comprise a single, integrally formed or molded structure. The diffuser may be used for diffusing any gas in any liquid but is in particular useful for the aeration of sewage in a sewage treatment plant. (Sinha-OEIS)
W76-02610

HYDRO-SEPARATOR FOR SLURRY,
Kurita Water Industries Ltd., Osaka (Japan). (Assignee).
H. Haji, H. Okada, and T. Takeuchi.
U. S. Patent No 3,915,865, 5 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2094, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, Water pollution control, *Sludges, *Slurries, *Sludge treatment, Absorption, Dehydration, Separation techniques, Equipment.
Identifiers: Scrapers.

An apparatus is described for removing water continuously at high efficiency from a slurry-like substance such as sludge by use of a water-absorbing material. Two endless water-pervious belts are revolved circularly around the conveyor zones and the slurry to be dehydrated or the sludge is continuously fed to the belts by means of the respective slurry feed units. While in travel on the belts, part of the water contained in the sludge is first separated by virtue of gravitational attraction then allowed to pass through the belts and removed from the lower sides of the belts. The sludge continues to travel in conjunction with the belts and reaches the water suction drums which dehydrate the sludge and convert it into a concentrated sludge. During the travel between the upper and lower pairs of squeezing drums, the layers of sludge on the two belts are combined into one and squeezed to release the entrained water. The dehydrated sludge moves together with the belts and arrives at the returning conveyor zone, at which time the sludge is removed from the belt surface by means of the scraper. The belts which have this been deprived of the sludge further advance and return to the respective horizontal conveyor zones. (Sinha-OEIS)
W76-02612

RE-USE OF MUNICIPAL SEWAGE FOR PURPOSES OF SANITARY PROTECTION OF WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
S. N. Cherkinskii, P. P. Markov, and L. N. Gabrilevskaya.
Gig Sanit. 8. 70-72. 1974.

Descriptors: *Water reuse, *Reviews, *Sewage treatment, *Waste water treatment, Municipal wastes, Public health, United States, Mexico.
Identifiers: Japan, United Kingdom.

From a review of the literature are presented methods of treating sewage in some cities (USA, England, Japan, Mexico), where the municipal effluents are used again in recycled water cooling systems in the refining, petrochemical, metallurgical and paper industries. The composition of municipal sewage after treatment is given.--Copyright 1975, Biological Abstracts, Inc.
W76-02614

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: PETROLEUM REFINING INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W76-02618

CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL,
Frumkin (Norman), Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02620

OPTIMIZATION OF WATER ALLOCATION, WASTEWATER TREATMENT, AND REUSE CONSIDERING NON-LINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES,
Utah Center for Water Resources Research, Logan.
A. B. Bishop, R. Narayanan, S. Pratishthananda, S. L. Klemetson, and W. J. Grenney.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 070, $6.00 in paper copy, $2.25 in microfiche. June 1975, Publication No PRWG123-2, Utah Water Research Laboratory, Logan. 126 p, 19 fig, 20 tab, 45 ref, 3 append. OWRT B-097-UTAH(1). 14-31-0001-4133.

Descriptors: Water reuse, Systems analysis, Linear programming, Water supply, Waste water treatment, Water costs, *Optimization, Seasonal, Water allocation(Policy), Water distribution(Applied), Utah, Model studies, River basins
Identifiers: Lower Jordan River basin(Utah).

Using systems engineering and operations research techniques, this report focuses on the optimal management and use of water of impaired quality in a water resources system, including utilization of irrigation return flows and other poor quality water, water quantity and quality management systems, and wastewater reclamation opportunities. The study develops a mathematical programming transporation or transshipment model formulated for the Lower Jordan River Basin in Utah. The model incorporates all 'possible' water resources (including sequential and recycled reuse of water) to supply spatially separated multi-sector water users considering non-linear costs with economics of scale for water supply and wastewater treatment, temporal aspects of seasonality and stochastic nature of water supply and demand, and the system effects of higher wastewater treatment levels. The results of the model runs give specific allocations of water from the available sources to meet use sector requirements over a planning horizon for 1975 to 2020. The comparison of results from the model can be used to analyze the interdependence of water supply, water pollution control, options for water salvage and reuse in order to better plan public investment in water and wastewater management facilities.
W76-02636

TREATMENT OF KRAFT PULP WASTEWATER WITH LIME (III): TREATMENT OF THE INTEGRATED BLEACHING ALKALINE WATER WITH LIME (KURAFUTO PARUPU HAISUI NO SEKKAISHOR (III): SARASHI ARUKARI SOGO HAISUI NO SEKKAI SHORI),
T. Kubo, S. Katoh, and Y. Kimura.
Shikoku Kogyo Gijutsu Shikenjo Hokoku, (Report of the Government Industrial Research Inst. Shikokee), Vol 7, No 2, p 61-65, August 1975, 3 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Chemical oxygen demand, Biochemical oxygen demand, Lime, Lignins, Suspended solids.

Lime treatment of the alkaline waste water from the kraft pulp bleaching process for the removal of color and COD components was studied. The bleaching waste water containing a high BOD, was treated by a combination of activated sludge and lime. The combined treatment achieved about and 80% removal of COD and about an 85% removal of lignin. The continuous carbonation treatment process results in about a 40 ppm suspended solids (SS) level in the effluent from this process; this is less than the SS level in the lime treated waste water. The SS concentration in the effluent from the carbonation process can be lowered to less than 20 ppm by the addition of seed crystal. (Orr-FIRL)
W76-02654

REVIEW OF LANDSPREADING OF LIQUID MUNICIPAL SEWAGE SLUDGE,
Battelle Columbus Labs., Ohio.
T. E. Carroll, D. L. Maase, J. M. Genco, and C. N. Ifeadi.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-67012-75-049, June 1975. 95 p, 4 fig, 18 tab, 72 ref. 1BB043; ROAP 21ASE; Task 011. 68-03-0140.

Descriptors: *Sludge disposal, *Sewage sludge, Operating costs, Municipal wastes, Public health, Environmental effects, *Sewage treatment, Treatment facilities, Surveys, Waste water treatment.
Identifiers: Land spreading, Sludge characteristics, Sludge handling, Soil conditioners.

The objective was to review and summarize existing information regarding landspreading of liquid municipal sewage sludge. Emphasis was given to obtaining information concerning the number of sewage treatment plants currently using landspreading. A questionnaire survey of 1909 sewage treatment plants in Federal Regions 2, 3, 4, 5, and 9 was conducted and selected operations were visited. The information and data gathered during the study are summarized relative to sludge characteristics, sludge handling and distribution systems, economics of landspreading, sludge-soil-plant interactions, public health considerations, land acquisitions, and survey of sewage treatment plants. The survey indicated that about 21 percent of the plants in the study regions are using landspreading routinely. Sixty-eight percent of the plants using landspreading have been conducting the practice for less than ten years. Of this 68 percent, over two-thirds have begun the practice only within the last five years. (EPA)
W76-02658

REPLACEMENT OF ACTIVATED SLUDGE SECONDARY CLARIFIERS BY DYNAMIC STRAINING,
FMC Corp., Itasca, Ill. Environmental Equipment Div.
M. Joyce, W. Schultz, and A. Strom.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-670/2-75-045, May 1975. 75 p, 13 fig, 8 tab, 4 ref, 4 append. ROAP 21-ASR, Task 039 1BB043, 68-03-0102.

Descriptors: *Sewage treatment, *Activated sludge, Aeration, *Aeration lagoons, *Waste water treatment, Pilot plants, *Separation techniques.
Identifiers: Dynamic straining, Ultrasonic transducer, *Liquid-solids separation, Mixed liquor solids control, *Clarifiers.

Pilot plant studies were conducted on domestic wastewater to determine the feasibility of replacing conventional acitvated sludge gravitational clarifiers by dynamic straining. The dynamic strainers consisted of a rotating cylinder cleaned by an internal ultrasonic transducer. A primary strainer was placed and operated directly in the mixed liquor in the aeration tank. A secondary strainer was installed and operated in a separate tank to further clarify the effluent from the primary strainer. This work indicated that dynamic straining is a technically feasible process for replacing conventional activated sludge gravitational clarifiers. Suspended solids removals of well over 99 percent were achieved with a single primary strainer operating in the pilot plant aerator with a mixed liquor suspended solids concentration of over 6,500 mg/l. When operated at lower specific flow rates, primary staining appears to be capable of consistently producing an effluent suspended solids in the 15-30 mg/l range. Present economic predictions indicate that plants equipped with primary and secondary dynamic strainers would cost more than plants utilizing conventional secondary gravity clarifiers. This factor can be tempered by several projected dynamic straining advantages. Two-stage dynamic straining has excellent application where space limitations exist. Secondary gravity clarifiers could be eliminated under the right conditions and aeration tank sizes could be appreciably smaller with the higher MLVSS concentrations achievable with dynamic straining. An existing overloaded activated sludge plant could be upgraded with primary straining only without expanding the facilities. In locations or applications where filamentous growth is prevalent, primary straining could be used to effectively control bulking. Durking the testing program, dynamic straining revealed itself to be resistant to shock loading. (EPA)
W76-02662

HIGHWAY AND SEWER IMPACTS ON URBAN DEVELOPMENT,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W76-02717

CHARGE-MOSAIC MEMBRANES,
Harvard Medical School, Boston, Mass. Biophysical Lab.
For primary bibliographic entry see Field 3A.
W76-02734

THE EFFECT OF INCREASING THE ORGANIC CARBON CONTENT OF SEWATE ON NITROGEN, CARBON, AND BACTERIA REMOVAL AND INFILTRATION IN SOIL COLUMNS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. C. Lance, and F. D. Whisler.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 57-65, 1 tab, 4 fig, 19 ref.

Descriptors: *Denitrification, *Filtration, *Sewage, *Sewage treatment, *Soil filters, Sewage bacteria, Sewage effluents, Carbon.
Identifiers: Organic carbon.

Denitrification is the only reaction capable of removing the tremendous quantity of nitrogen applied when high-rate land filtration systems are used for renovating sewage water. This study determined that a shortage of organic carbon limits denitrification, and the effects of increased dissolved organic carbon concentrations on soil clogging and movement of fecal coliform bacteria are clearly shown. Finally, the removal of dissolved organic carbon at different carbon concentrations during high rate soil filtration (40-50 cm/day) also limits denitrification. (McLachlan-Arizona)
W76-02741

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APPLICATIONS OF DIRECT OSMOSIS: DESIGN CHARACTERISTICS FOR HYDRATION AND DEHYDRATION,
Arizona Univ., Tucson. Dept. of Physics.
J. O. Kessler, and C. D. Moody.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 91-100, 3 fig, 8 ref, 1 append.

Descriptors: *Osmosis, *Hydration, *Dehydration, *Semipermeable membranes, Water pollution, Industrial wastes, Irrigation water, Hydrostatic pressure, *Waste water treatment.

In direct osmosis water automatically flows through a semipermeable membrane from a source solution of low concentration to a driving solution with higher solute content. The process requires a membrane which is impermeable to the solutes; hydrostatic pressure differences are not directly involved and can be set equal to zero. This study summarizes basic physical principles and introduces some quantitative design factors which must be understood on both a fundamental and an application level. In principle, direct osmosis is a low-technology, low-power consumption method for reducing the water volume of industrial effluents or liquid agricultural products, and for reclaiming brackish irrigation water. In the latter application the driving solution may utilize fertilizer as a solute. The source solution is drainage that contains harmful salt components. (McLachlan-Arizona)
W76-02745

APPLICATION OF DIRECT OSMOSIS: POSSIBILITIES FOR RECLAIMING WELLTON-MOHAWK DRAINAGE WATER,
Arizona Univ., Tucson. School of Renewable Natural Resources.
C. D. Moody, and J. O. Kessler.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Adademy of Science, April 11-12, 1975, Tempe, Arizona, p 101-111, 2 fig, 3 tab, 9 ref.

Descriptors: *Osmosis, *Drainage water, Fertilizers, *Arizona, *Reclaimed water, Water pollution, Nitrogen, Brackish water, Water reuse.
Identifiers: *Ammonium sulfate, Yuma Valley(Ariz), Imperial Valley(Calif), Welton-Mohawk Irrigation and Drainage District.

A direct osmosis plant can reclaim twenty to thirty thousand acre feet of Wellton-Mohawk brackish drainage water using no more nitrogen fertilizer than is normally used in the Yuma, Coachella Valley, Imperial Valley and the boardering Mexican areas. On a per-acre basis ammonium sulfate-driven direct osmosis can reclaim about one percent of the total irrigation requirement from 3000 ppm brackish water. In addition to the ammonium sulfate-driven direct osmosis efficiency, the by-product energy recovery of the manufacture of the fertilizer and the low technology inherent in direct osmosis processes make direct osmosis an appealing water reclaiming process. (McLachlan-Arizona)
W76-02746

SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: RESEARCH RESULTS,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W76-02757

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF,
URS Research Co., San Mato, Calif.
G. Amy, R. Pitt, R. Singh, W. L. Bradford, and M. B. LaGraff.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-440/9-75-004, December 1974. 214 p, 36 fig, 38 tab, 162 ref, 4 append. EPA 1BB034/ROAP 21 ATB/Task 76B, 68-01-1846.

Descriptors: Drainage, Water pollution, Surface waters, *Runoff, *Water quality, *Storm sewers, Hydrology, Hydraulics, *Mathematical models, *Urban runoff, Water pollution control, Urban hydrology, Drainage systems, Water management(Applied).
Identifiers: Drainage systems.

This manual provides technical assistance to state and local water quality management planners to enable them to quantify within reasonable limits the urban non-point water pollution problem in a local planning area without extensive data generation, and to make a preliminary evaluation of cost effective abatement and control practices. The manual prescribes procedures for several levels of input, each requiring more self-generated data, with increasingly sophisticated results. A state-of-the-art and an extensive bibliography on urban story water runoff is presented in the appendix. A glossary is also included. The manual is not intended to be used as a basis for abatement design but does provide a guide to data generation for this purpose. (EPA)
W76-02758

AN ALTERNATIVE SEPTAGE TREATMENT METHOD: LIME STABILIZATION/SAND-BED DEWATERING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
W. A. Feige, E. T. Oppelt, and J. F. Kreissl.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 816, $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/2-75-036, September 1975. 52 p, 14 fig, 10 tab, 17 ref. EPA 1BC611.

Descriptors: *Waste water treatment, *Septic tanks, Lime, *Dewatering, Sludge disposal, Costs, Treatment facilities.
Identifiers: *Sand bed dewatering, *Septage, *Lime stabilization.

Approximately 5 billion gal (18,927,000 m3) of septage must be annually disposed of in the United States, a volume that is nearly equal to that of undigested raw and secondary municipal sludges. Few desirable methods exist for disposing of the sludge that is periodically pumped from septic tanks. Results are presented from a pilot study of one alternative septage treatment method - lime stabilization followed by covered sand-bed dewatering. The study was conducted in two phases. Phase I (4 months) consisted of the general, chemical, and biological characterizations of the incoming septage. Attempts were made to thicken the material via stirring, polyelectrolyte addition, and lime addition. Phase II (9 months) concerned itself with the application of lime septage onto covered sand beds. Four experimental runs were conducted to assess the feasibility of such an approach. The septage was limed to pH 10.5, 11.0, and 11.5 and applied at 8-in (20.3-cm) depths. Underdrainage and cake characteristics were monitored and practical sand-bed application rates were determined. A materials balance of chemical constituents around the system was made. A cost estimate for the treatment of septage at small treatment plants via this method is included. (EPA)
W76-02759

ACTINOMYCETES OF SEWAGE-TREATMENT PLANTS,
Rutgers - The State Univ., New Brunswick, N. J. Waksman Inst. of Microbiology.
H. A. Lechevalier.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 914, $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/2-75-031, September 1975. 62 p, 23 tab, 19 ref. EPA 1BB043 (ROAP 21-ASR, Task 038), R802003 (17050 GUJ).

Descriptors: *Actinomycetes, *Activated sludge, Microorganism, *Aeration, *Sewage treatment, *Waste water treatment, Foaming isolation.
Identifiers: Digester supernatant, Nocardia amarea, Aeration tanks.

In some sewage-treatment plants of the activated sludge type, a thick foam may be formed at the surface of the secondary aeration and settling tanks. Such foams have often been found to be rich in actinomycetes. This report covers the work done on this problem between April 1971 and May 1974. Over 250 strains of actinomycetes have been isolated from foams or activated sludge from 19 different sewage-treatment plants located in 8 states. The actinomycete most commonly associated with foams is a previously underscribed Nocardia which has been given the name N. amarae. It has been domonstrated experimentally in the laboratory that N. amarae may cause the kind of foam observed in the plants. Factors affecting the growth of N. amarae have been studied and a method of control of the foam by addition of digester supernatant to the activated sludge is proposed. (EPA)
W76-02760

HATFIELD TOWNSHIP, PENNSYLVANIA, ADVANCED WASTE TREATMENT PLANT,
Tracy Engineers, Inc., Camp Hill, Pa.
T. W. Greenlund, and F. R. Gaines.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 622, $7.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/2-75-030, September 1975. 223 p, 40 fig, 46 tab, 14 ref, 6 append. EPA 1BB043 (ROAP 21-ASO;Task 046). 11060 FRQ.

Descriptors: *Waste water treatment, *Activated sludge, *Nitrification, *Filtration, Phosphorus, *Tertiary treatment, *Coagulation, Water quality standards, Lime, Pennsylvania, *Treatment facilities.
Identifiers: Phosphorus control, Effluent standards, Lime coagulation, Alum precipitation, *Flow equlization.

The Hatfield Township, Pennsylvania, Water Pollution Control Plant was designed to encompass primary chemical treatment, secondary combined activated sludge and nitrification facilities, tertiary chemical tube clarification and mixed media filtration. The operation of the facility demonstrated that the use of flow equalization facilities improves plant operations by reducing and stadardizing chemical concentrations. Phosphorus is removed efficiently in a combined primary-tertiary phase with operations personnel having the flexibility to optimize each process. Lime feed control by pH is easily accomplished, although recirculation of primary sludges is not always necessary. Tube clarifiers and mixed media filters combine to produce a highly polished effluent. Nitrification was observed to some extent in this modified facility; however, it was extremely difficult to control. (EPA)
W76-02761

POLLUTION ABATEMENT FROM CATTLE FEEDLOTS IN NORTHEASTERN COLORADO AND NEBRASKA,
Agricultural Research Service, Fort Collins, Colo.

L. K. Porter, F. G. Viets, Jr., T. M. McCalla, L. F. Elliott, and F. A. Norstadt.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 242, $5.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-015, June 1975. 120 p, 27 fig, 34 tab, 53 ref. EPA 1BB039. EPA-IAG-D4-0446.

Descriptors: *Farm wastes, Cattle, *Feed lots, *Nebraska, Waste identification, Waste disposal, *Pollution abatement, *Colorado, Agricultural runoff, *Waste treatment.
Identifiers: Land application, Water pollution potentials, Wastes characteristics.

Climatic factors, feedlot runoff, and organic material in the runoff were evaluated in experimental and commercial feedlots. The effects of slope, stocking rates, terraces, basins, and holding ponds were evaluated to obtain the best controls for containing runoff. In eastern Nebraska, 70 cm annual precipitation produces 23 cm of runoff; whereas, in northeastern Colorado, 37 cm annual precipitation gives only 5.5 cm of runoff. Large applications of runoff liquid, up to 91 cm on grass-Ladino and 76 cm on corn, in Nebraska did not decrease yields; however, in northeastern Colorado, the concentrated high-salt runoff required dilution before direct application to crops. The organic manure-soil interface severely restricts the movement of water, nitrates, organic substances, and air into the soil beneath feedlots. The amounts of NO3-N in soil cores taken from Nebraska feedlots and croplands ranked as follows: abandoned feedlots > feedlot cropland > upland feedlots > river valley feedlots > manure mounds > alfalfa > grassland. Feedlots contribute NH3, amines, carbonyl sulfide, H2S, and other unidentified substances to the atmosphere. Ammonia and amine can be scavenged from the air by green plants and water bodies. Anaerobic conditions in feedlots are conducive to the production of carbonyl sulfide, H2S, and amines. Management practices, such as good drainage, that enhance aeration will decrease the evolution of these compounds. (EPA)
W76-02762

CHEMICAL COAGULATION/MIXED MEDIA FILTRATION OF AERATED LAGOON EFFLUENT,
Amoco Oil Co., Yorktown, Va.
J. F. Grutsch, R. C. Mallatt, and A. W. Peters.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 148, $5.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-025, June 1975. 103 p, 44 fig, 5 tab, 7 ref, 7 append. EPA 1BB036. S803026-01.

Descriptors: *Filtration, Particle size, *Coagulation, Construction, Costs, *Aerated lagoons, *Waste water treatment, Zeta potential, Operation and maintenance, Treatment facilities.

Operating problems and the effect of operating variables were investigated during fullscale plant operations in the scalping mode. Influent suspended solids concentration and water temperature were the most significant independent variables. Mechanical limitations were studied, including a filter bed disturbance that necessitated a total bed replacement. High, localized backwash velocity caused the invisible disturbance which reduced turbidity removal from about 80 percent to 50 percent. Diagnostic procedures, design changes, and the costs of operation and maintenance are reported. A cold weather study showed that a three-chemical destabilization pretreatment system is required for filtration of biocolloids in brackish water. Determination of the optimal three-chemical destabilization system using zeta potentials required evaluation of zeta potentials in a manner which sorted out the effect of double-layer repression. The colloid destabilization mechanisms of charge neutralization and bridging were required for optimal filter performance. For colder water temperatures, even with optimal chemical treatment, the filter hydraulic loading must be decreased. The change in hydraulic loading with temperature related directly to the water's viscosity. (EPA)
W76-02763

SURVIVAL OF PATHOGENS IN ANIMAL MANURE DISPOSAL,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5C.
W76-02765

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5F.
W76-02766

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIX A.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5F.
W76-02767

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIXES B AND C.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5F.
W76-02768

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIX D.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5F.
W76-02769

EFFLUENT TREATMENT PROCESSES,
Gulf States Paper Corp., Tuscaloosa, Ala. (Assignee).
R. R. Fuller.
United States Patent 3,740,363, Issued Jun 19, 1973. Official Gazette of the United State Patent Office, Vol 911, No 4, p 1008-1009, June, 1973. 1 fig.

Descriptors: *Waste water treatment, *Pulp and paper industry, *Industrial wastes, *Patents, Effluents, Color, Chemical precipitation, Sludge treatment, Dewatering, Water reuse.
Identifiers: Decolorization.

A waste effluent treatment process which involves contacting a waste effluent with a metal salt reagent, preferably alum mud, has been patented. The method is applicable for the treatment of pulp and paper mill wastes. Effluent is odorized and a substantial portion of the organic content is precipitated. This precipitate and the sludge is dewatered, then calcined, and the reagent is regenerated from the ash for use again in a cyclic process. The decolorized effluent is biooxidized in a multistage sequence and subsequently is sufficiently pure for recycle purposes. The purified effluent may also be bleached prior to recycle. (Sandoski-FIRL)
W76-02771

PROCESS FOR TREATING PULP,
P. E. Schick.
Canadian Patent 925,657, Issued May 8, 1973. Patent Office Record, Vol 101, No 19, p 1482, May, 1973.

Descriptors: *Waste water treatment, Pulp and paper industry, *Industrial wastes, *Pulp wastes, Oxidation, Temperature, Patents
Identifiers: Sulfite pulping wastes

A process to simultaneously produce sulfite pulping chemical from a spent pulping medium by the exothermic oxidative conversion of sodium sulfide to sodium sulfite has been patented. The temperature in exothermic reactions is controlled and the reaction heat is utilized to produce steam to be mixed with air for use in the oxidation process. Ground particles of a spent pulping smelt are treated in a fluidized bed reactor in contact with moving air enriched with steam for about ten seconds to two hours. The weight ratio of steam to air ranges from about 0.2:1 to 1.2:1. The temperature in the reactor is adiabatically controlled and the heat of reaction generated in the reactor is absorbed by adiabatic cooling to form the steam used in the reactor. (Sandoski-FIRL)
W76-02773

PROCESS FOR THE RECOVERY OF WASTE PICKLE LIQUOR,
L. J. Hansen.
United States Patent 3,745,207, Issued July 10, 1973. Official Gazette of the United States Patent Office, Vol 912, No 2, p 676, July, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Iron, Oxidation, Water reuse.
Identifiers: *Waste pickle liquor, Metal industry.

A process for the recovery of waste pickle liquor has been patented. In the process, waste acid pickle liquor is converted into iron oxide and acid by depositing it on a compact moving bed and sweeping the bed with hot oxidizing gases. (Sandoski-FIRL)
W76-02774

NEW TECHNOLOGY FOR A WIDE RANGE OF PROCESSES FEATURED AT ACHEMA.
Chemical Age International, Vol 107, No 2816, p 11, 17, July 6, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical wastes, Oxidation.
Identifiers: *Japan, Catalytic oxidation.

The Chiyoda Chemical Engineering and Construction Company Limited of Japan has developed a new process entitled Chiyoda Thoroughbred 101 Flue Gas Desulphurisation Process. Operating successfully at four plants in Japan, the process is based on the absorption and catalytic oxidation of sulfur dioxide in a dilute solution of sulfuric acid and dissolved catalyst, ferric sulfate, that serves as the absorbent. The absorbed sulfur dioxide then reacts with the oxygen charged to the unit in the form of air, to form sulfuric acid. The acid is withdrawn and can be treated with one of the following compounds: limestone, quicklime, calcium oxide, slaked lime, calcium hydroxide, or carbide residue. The sulfate ion is thus precipitated as gypsum. Clogging problems in the system due to the formation and recycling of calcium sulfate are avoided by the increased solubility of the compound in increasing strengths of acid in the absorber. Poisoning effects with an iron catalyst are minimal and the activity of the catalyst reaches that of the conventional manganous sulfate catalyst between 40 C and 60 C. Soluble and corrosive salts accumulating in the absorbent are removed by economical purging. (Sandoski-FIRL)
W76-02776

METHOD FOR MANUFACTURING SULFITE PULP COOKING LIQUOR FROM SULFITE PULP SPENT LIQUOR,
A. Mita, and T. Ishida.
Canadian Patent 928,009, Issued June 12, 1973. Patent Office Record, Vol 102, No 24, p 1930, June, 1973.

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Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, *Patents.
Identifiers: Sulfite pulp, Calcium sulfate.

A method for manufacturing sulfite pulp cooking liquor from sulfite pulp spent liquor has been patented. Sulfite pulp cooking liquor is produced from sulfite pulp spent liquor by combusting condensed sodium-based spent liquor in an oxidizing atmosphere, adding a calcium compound, and blowing sulfur dioxide gas into an aqueous solution of the ash. This produces an aqueous solution of sodium bisulfite containing calcium sulfate and separates out the calcium sulfate. Alternately, the condensed spent liquor may be combusted in a reducing atmosphere with sulfuric acid added to the resultant smelt to produce an acid solution to which a calcium compound is added and into which culfur dioxide gas is blown. (Sandoski-FIRL)
W76-02777

INTEGRATED WASTE WATER TREATMENT FOR REUSAGE AFTER CYANIDE TYPE PLATING,
L. E. Lancy.
Canadian Patent 929,839, Applied October 27, 1970. Issued July 10, 1973, Patent Office Record, Vol 103, No 27, July, 1973.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chelation.
Identifiers: Plating wastes.

A method for the treatment of solution containing a chelating compound and a dissolved content of plating metal has been patented. Under this patent, used or waste wash water treatment solution from individual cyanide type plating lines that apply coatings of different metals on workpieces is treated with a salt of such metals as calcium, barium, lithium, aluminum, and magnesium. The salt acts as an exchange element in the chelating compound to replace a more noble dissolved metal content in the wash water treatment solution. It is then reused to rinse drag-out from workpieces being processed in the different plating lines. (Sandoski-FIRL)
W76-02779

RECYCLING BRINE FROM PICKLING,
. R. Geisman, and R. E. Henne.
Ohio Report, Vol 58, No 4, p 76-77, July/August, 973, 2 tab.

Descriptors: *Recycling, *Brines, *Industrial vastes, Waste disposal, Coagulation, Filtration, Chemical precipitation, Laboratory tests, Food rocessing industry.
dentifiers: Pickling wastes.

Laboratory studies were conducted to screen standard water treatment chemicals for coagulation of uspended solids in pickling brine. Using a treatent which produced maximum coagulation, the aboratory tests were increased in scale and an atempt was made to continuously filter the treated rine. Research also was conducted at a pickle rocessing plant using larger quantities of spent rine to determine operating costs and feasibility operation. Of the five water treatment chemiils screened, sodium hydroxide was effective d inexpensive. In further testing, it was found at adjusting the brine pH to 11 with sodium droxide resulted in a heavy precipitate. At this f a filtrate with no protein was produced. A oratory scale filter was constructed, including activated charcoal bed for final filtration. The d product was a colorless brine containing no rbohydrates or proteins. Final pH adjustment s made with hydrochloric acid to the neutral int, producing water and salt. After extensive ts at the pickling plant, it was determined that atment of the spent brine for reuse results in a ings for the processor. (Sandoski-FIRL)
76-02782

SEPARATION, DEWATERING AND DISPOSAL OF SUGAR BEET TRANSPORT-WATER SOLIDS,
American Crystal Sugar Co., East Grand Fords, Minn.
I. V. Fordyce, and A. M. Cooley.
Sugar y Azucar, Vol 68, No 7, p 17-20, July, 1973, 4 tab.

Descriptors: *Food processing industry, *Filtration, *Waste water treatment, Alkalinity, Lime, Sugar beets, Industrial wastes, Dewatering, Waste disposal, Flow rates.
Identifiers: Vacuum filtration.

Vacuum filtration of thickened underflow from clarification of beet wash and transport water was achieved at reasonably high rates by use of an Eimcobelt filter. The solids content of the slurry was an important factor, with best results being obtained when solids content in the feed were above 10% and preferably over 20%. The addition of calcium hydroxide to slurries with pH values of around 11 improved filtration rates; at pH values near 7, there was very little pickup of cake. Research results further indicated that the recovery of an alkaline pH is difficult to achieve with the use of lime alone, but can be accomplished by the use of paraformaldehyde in the transport water at a 0.02% dosage. Lime alone can be used in reasonable amounts for pH control and bacterial control, after formaldehyde has been used as a bactericide. Both lime cake and fly ash were effective filter aids. Addition of lime filter cake from juice purification to the clarifier gave an underflow with the best filtration characteristics of the combinations tried. (Sandoski-FIRL)
W76-02783

DEWATERING OF DISTILLERY SPENT WASH IN THE PRODUCTION OF BY-PRODUCT DREG MEAL,
R. M. Kerr.
United States Patent 3,747,758. Issued July 24, 1973. Official Gazette of the United States Patent Office, Vol 912, No 4, p 1406, July, 1973. 1 fig.

Descriptors: *Patents, *Dewatering, *Food processing industry, *Centrifugation, Screens, Treatment facilities, *Waste water treatment, Waste disposal, Dissolved solids, Suspended solids.
Identifiers: *Whisky production wastes, Distillery wastes.

A patented method and apparatus for recovering dissolved and suspended solids from a process for the production of grain whisky is described. The wort from a mashing tun or spent wash from distillation plant is fed onto a continuously moving filter screen in the form of a continuous belt. The filter screen moves at several hundred feet per minute so that a major portion of the liquid filters by gravity, leaving on the screens a random dispersion of solids. The screens containing solids are passed over a vacuum station for further dewatering. Dewatered solids are removed by adhesion to at least one roller where they are removed by centrifugal force into a hopper. (Sandoski-FIRL)
W76-02784

A NEW METHOD FOR THE PURIFICATION OF SUGAR-PRODUCING PLANT-GENERATED WASTE WATERS AT THE BMA ENTERPRISES (NOVVY SPOSOB OCHISTKI STOCHNYKH VOD SAKHARNYKH ZAVODOV FIRMY BMA),
B. M. Shakhnovich, and K. V. Sizov.
Sakharnaya Promyshlennost', No 6, p 71-72, 1973, 1 fig.

Descriptors: *Waste water treatment, *Food processing industry, *Activated sludge, *Biological treatment, Aeration, Biochemical oxygen demand, Anaerobic treatment, Retention.

A new 99% efficiency biological method for the purification of sugar factory-generated waste water, which requires minimum space and time, has been introduced at the BMA Company in West Germany. The BOD content is reduced from an average of 3000 mg/liter to 30 mg/liter and maladorous emissions are prevented. The effluents are first treated in an anaerobic basin, after which mineralization is achieved by means of aeration and activated sludge in another activated sludge aeration basin. The BOD value of the effluent decreases by 30 to 50% due to retention of 2.5 days in an anaerobic collector. (Takacs-FIRL)
W76-02785

PETROCHEMICAL WASTES.
Effluent and Water Treatment Journal, Vol 13, No 6, p 383, June, 1973.

Descriptors: *Oil wastes, *Anaerobic treatment, *Pre-treatment, Lagoons, Pilot plants, Chemical oxygen demand, *Waste water treatment, Industrial wastes, Retention.
Identifiers: *Petrochemical wastes.

The Union Carbide Corporation has studied anaerobic lagoon pre-treatment of petrochemical wastes. A pre-treatment stage by anaerobic lagoons was tested, principally on a pilot scale, in two lagoons 50 by 100 ft and at depths of 6 and 12 ft. A retention time of 15 days was maintained in each lagoon, and samples were analyzed for BOD, COD, pH, volatile acids, alkalinity, total carbon, and sulfur compounds. Batch experiments showed that the bottom sludge and surface photosynthetic layers both could provide about 50% COD reduction. Intermediate layers provided a lower treatment level of about 20%. Continuous flow experiments in which natural mixing was allowed between zones indicated that the influence of depth on COD removal was slight; however, surface sulfide levels were quite dependent on depth, being lower at shallower depth. Lagoon temperature, particularly for winter conditions, was also a function of depth. Lagoon performance was correlated with volumetric-organic loading and temperature for a number of lagoon installations treating various petrochemical wastes. (Sandoski-FIRL)
W76-02786

AUTOMATIC SELF-CLEANING SIEVE FILTERS FOR INDUSTRIAL AND COOLING WATERS (AUTOMATISCH SELBSTREINIGENDE SIEBFILTER FUER BETRIEBS-UND KUEHLWASSER).
Technica, Vol 22, No 12, p 1186-1187, June, 1973. 4 fig.

Descriptors: *Filters, *Cleaning, *Chemical wastes, *Cooling water, Powerplants, Industrial wastes, Food processing industry, Waste disposal, Iron, Steel, Plastics, Chemical industry, Steel pipes.

The Q-15 Series II Royles-Adams Poro-Edge-Strainers, which are automatic self-cleaning tube filters, have throughput capacities up to 320,000 liters per minute. The tube filter is formed by a bundle of 12 to 157 pipes made of stainless steel formed in such a manner that wire with a trapezoid cross-section is spirally wound over parallel rods to which it is welded by an underwater welding process. V-slots of 125 to 250 microns are formed between two adjacent turns which retain solid particles present in the liquid without increasing the filter resistance at any throughput capacity. The maximum operating pressure is 10.5 kg/sq cm and when pressure loss reaches a preset value, counterflow flushing starts automatically. The self-cleaning sieve filters can be used to protect pumps in powerplants and waste water treatment facilities, and to purify industrial and cooling water in the plastics, iron and steel, food processing, chemical, and pharmaceutical industries. (Takacs-FIRL)
W76-02787

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THICKENING SEWAGE/WASTE-WATER.
Netherlands Patent NL 7213266. Issued May 24, 1973. Derwent Netherlands Patents Report, Vol U, No 24, p D1, May, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Sewage treatment, Sludge treatment, *Patents, Flocculation, Polymers, Coagulation.
Identifiers: Thickening, Chemical treatment.

A patent has been issued for a method of thickening of sewage and/or industrial waste water. An aqueous solution of a water soluble vinyl addition polymer (formed by the inversion of a polymer latex) is added, under flocculating conditions to the waste liquid to be treated. The solids are permitted to decant forming a clear supernatant layer. The latex is prepared by forming a water-in-oil emulsion from: water containing a dissolved ethylenically unsaturated monomer to form a monomer phase forming 30-70 weight percent of the emulsion; an inert hydrophobic liquid, 0.1-10 weight percent of a water-in-oil emulsifier; and a free radical initiator. The emulsion is heated to generate free radicals and polymerize the monomer in the water to form a polymer latex. The system has a high coagulating efficiency and eliminates the need for dissolving a solid polymer. (Sandoski-FIRL)
W76-02788

FLUIDIZED BED ION EXCHANGER TO BE USED FOR EFFICIENT TREATMENT OF POLLUTED LIQUID WASTE.
Industrial Heating, Vol 40, No 9, p 1642, September, 1973.

Descriptors: *Industrial wastes, *Ion exchange, *Treatment facilities, Effluents, Water pollution control, *Waste water treatment, Liquid wastes.
Identifiers: Fluidized bed ion exchanger.

A new commercial size fluidized bed ion exchanger will be used at a large Tennessee smelting plant for the treatment of highly polluted liquid waste. Designed and fabricated by Liquitech Incorporated, the system continuously treats 600 gallons per minute and allows the water to be recycled or safely vented to public water bodies. The fluidized bed approach may be applied to systems now served by conventional ion exchangers. In addition to increased regenerant efficiencies and significant reductions in plant size and waste effluent volumes, the method defines an economic method of water pollution control. (Sandoski-FIRL)
W76-02789

PURIFICATION OF EFFLUENT CONTAINING HEAVY METALS.
Belgian Patent BE 797616. Issued July 16, 1973. Derwent Belgian Patent Abstracts, Vol U, No 37, p D4, July, 1973.

Descriptors: *Patents, *Heavy metals, *Waste water treatment, *Industrial wastes, Chemical precipitation, Ion exchange, Metals, Chromium, Nitrates, Lead, Iron, Aluminum, Zinc.
Identifiers: Cyanide.

A purification method for effluent containing heavy metals has been patented. In this process industrial effluent is treated by the removal of heavy metal ions by chemical displacement with a more electropositive cheaper metal, such as Fe or Al, in a bed of metal particles. The ions of the cheaper metal exchange with the heavy metal, which deposit on the particles. Effluents which may be treated by this method are those containing chromium, cyanides, nitrates, and lead. The deposits are released by abrasion between particles produced by air fluidization in the presence of sand. When the elecropositive is aluminum or zinc, the surface is activated by acids or bases. When the electropositive metal is iron, an oxidizer may be added. The reaction zone contains an anode and a cathode at a potential difference. The heavy metals are precipitated as easily recoverable deposits on the electropositive metal. (Sandoski-FIRL)
W76-02790

THE DEPENDENCE OF THE COMPLETENESS OF NONFERROUS HEAVY METAL SEDIMENTATION FROM WASTE WATERS ON THE PROPERTIES OF THE FILTRATING FABRIC (ZAVISIMOST' POLNOTY OSAZHENIYA TYAZHELYKH TSVETNYKH METALLOV IZ STOCHNYKH VOD OT SVOYSTV FIL'TROVAL'NOY TKANI),
For primary bibliographic entry see Field 5A.
W76-02791

MERCURY RECOVERY.
French Patent FR 2162026. Issued July 13, 1973. Derwent French Patents Abstracts, Vol U, No 39, p M3, July, 1973.

Descriptors: *Polymers, *Patents, *Mercury, *Recycling, *Waste water treatment, Industrial wastes, Electrolysis.

In this patented process, mercury is eliminated from waste water obtained from the electrolysis of alkali metal chlorides, containing Hg salts. The solution is contacted with a homo- or copolymer of acrylothioamide. Mercury is recovered for reuse. The ratio of nitrile to thioamideor thiolimine groups is between 12 and 0.6. This copolymer is a polyacrylothioamide/divinylbenz ene/acetylstyrene/styrene copolymer or polyacrylothioamide/methyl methacrylate copolymer. The copolymer has a sulfur content greater than 15 mole percent. The polymer is used in the expanded state or in the form of fibers. (Sandoski-FIRL)
W76-02792

WASTE CONTROL FOR JOB PLATERS,
F. Pollard.
Industrial Finishing, Vol 49, No 11, p 67-68, November, 1973. 1 tab.

Descriptors: *Copper, *Nickel, *Chromium, *Industrial wastes, *Waste water treatment, *Chemical precipitation, Metals, Capital costs, Equipment, Sewage treatment, Filtration.
Identifiers: Job shops, Plating wastes, Cyanide.

In the Detroit, Michigan, area, recent innovations have been made for the control of plating wastes including copper, nickel, chromium, and cyanide in the job shop. The individual plater may meet his effluent requirements with negligible capital costs, using low-cost equipment and chemicals. Hexavelent chromium is reduced to the trivalent state with ferrous sulfate obtained free from steel piclers. Treatment is achieved by running water into a 55-gal drum of ferrous sulfate with a hole in its bottom and a screen six inches above the hole. Dissolved ferrous sulfate is carried to the rinse stream. Cyanide may be destroyed by the trickling of sodium hypochlorite into the stream of rinse water from copper baths. About five gallons of the commercial 16.5% solution is required per pound of cyanide, and copper is precipitated. Nickel may also be precipitated out of the rinse water by comgining electrocleaner rinse water with the rinse stream from the nickel tanks. The alkalinity from the electrocleaner raises the pH well above 8.0 at which point the nickel leaves the solution as hydroxice. The precipitated metals are removed by settling and filtration at the Detroit Sewage Plant. (Sandoski-FIRL)
W76-02793

XANATHATE REMOVAL FROM WASTE WATER,
I. I. Shabunin.
Soviet Patent SU 361147. Issued February 6, 1973. Soviet Inventions Illustrated, Vol U, No 38, p D9, February, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Irradiation, Metals, Metallurgy, *Patents.
Identifiers: *Xanthate removal, Non-ferrous metals.

A method has been patented for xanthate removal from waste water, which may be used in non-ferrous metallurgy. Waste water is irradiated with light of the wavelength 2500-5500 angstroms to decompose the xanthates. In this example, waste water containing 6.4 mg/liter butyl xanthate at a pH of 7 was irradiated with light over the full spectrum while flowing at a water depth of 15 mm and a speed of one cm/sec under an intensity of 0.8 volt/sq cm. This lowered the xanthate concentration to 0.1 mg/liter over 25 minutes. (Sandoski-FIRL)
W76-02794

COAGULANT AID CLEARS THE WATER FOR A WIRE MANUFACTURER.
Industrial Wastes, Vol 19, No 5, p 31, September/October, 1973.

Descriptors: *Coagulation, *Waste water treatment, *Industrial wastes.
Identifiers: Coagulant aids.

Southwire Company of Carrollton, Georgia, has purchased a design and treatability system to remove oil and copper from their waste water. This wire manufacturer also made major revisions in its inplant piping to separate the contaminated water from clean water which was used for cooling. To treat oil effluent which was not hauled away by tankers, a coagulant aid called Claracel was utilized. Claracel reduced the alum dosage requirement from 12,000 to 4000 mg/liter, and the lime dosage from 8000 tp 2500-3000 mg/liter. The treatment plant began fulltime operation in April, 1972. Tests indicated that the combination of alum, lime, and Mogul Claracel works well. Oil concentration levels were about 10% or less, requiring only 1000 mg/liter of alum, 750 mg/liter of lime, and 25 mg/liter of claracel. Operating costs were about $7 a batch for the alum, $3 for the lime, and $3 for the coagulant. (Sandoski-FIRL)
W76-02795

PURIFICATION OF INDUSTRIAL WASTE WATER CONTAINING OIL, FAT AND SOLVENTS WITH IMPROVED SEPARATING AGENTS (REINIGUNG VON OEL, FETTUND LOESUNGSMITTELHALTIGNE INDUSTRIEABWAESSERN MIT VERBESSERTEN TRENNMITTELN).
W. Schmity.
Chemische Industrie, Vol 25, No 8, p 499-501, 1973. 5 fig.

Descriptors: *Waste water treatment, *Separation techniques, *Oil wastes, Industrial wastes, Adsorption, Centrifugation, Filtration, Oily water, Waste water disposal.
Identifiers: Hydrophobic silicic acid.

Standards in West Germany require that the oil content in industrial effluents must be reduced to a petrol ether extractable residue of 10-20 mg/liter before discharge to sewers. The stable oil-in-water emulsions cannot be broken up by mechanical processing. Products of the Degussa Works two separating agents, B-20 and B-22, have been used with good results for the breaking up of these emulsions. Both are powders which contain as the principal component a highly dispersed hydrophobic silicic acid which because of its oleophilic properties adsorbs several times its own weight of oil. Both preparations worked satisfactorily with effluents containing 0.5 and 1.0% oil rendered highly stable by a high concentration of surfactants. In addition to the oil, metal hydroxides are adsorbed and thus an overall excellent purification effect is achieved. B-22 is added to the effluent in amounts of one to 2 kg/cu m washing water emulsion. The one-step breakup and adsorption process take

veral minutes of mechanical mixing in a tank at tation speeds of 1000 rpm's and flakes of silicic id with the adsorbed oil are removed by filtra- n or centrifugation; the oil cake is incinerated avine Si02, or dumped under controlled condi- ns. (Takacs-FIRL)
76-02796

DUSTRIAL WASTE WATER TREATMENT LANT.
rench Patent FR 2162580. Issued July 20, 1973. erwent French Patents Abstracts, Vol U, No 40, D3, July, 1973.

escriptors: *Waste water treatment, *Industrial astes, *Patents, *Oil, Coagulation, Treatment cilities, Costs, Separation techniques, Tanks.

n industrial waste water treatment plant with ncentric tanks has been designed for removal of ntamination, in suspension or emulsion, by oil. this patented system waste is fed, together with coagulant and alkali, into the base central part of inner coagulation tank. The resultant flakes of droxide are formed, bonding the contamination. he resultant scum is extracted into an annular ough in the inner wall of the tank, then into a ncentric flotation separation tank around the ner tank. The plant is compact and relatively in- pensive.
76-02797

OW A CHEMICAL PLANT BEATS POLLU- ON.
anadian Controls and Instrumentation, Vol 12, o 9, p 66-67, September, 1973.

escriptors: *Industrial wastes, *Waste water eatment, *Chemical wastes, *Dentrification, onitoring, Remote sensing, Operating costs, Pol- tant identification, Biochemical oxygen demand, eatment facilities.

new denitrification plant has been installed at Pont's Maitland chemical and fibers manufac- ring plant and is equipped with an extensive mote pollution monitoring network. This net- rk consists of on-stream oxygen meters, pH eters, and other analyzers to alert operators in a ntral control room as soon as any of the moni- red parameters of the effluent rise above ac- ptable levels. The denitrification plant is a dified activated sludge process, and will treat mgd of process effluent. It will remove 53,000 unds of BOD daily, and 8000 pounds of rogenous materials. Organic carbon content of effluent will be reduced by 80 to 90% and the rogenous content by about 60 to 70%, which is nsidered a good level of efficiency at relatively w capital and operating costs. Scrubbers have en installed on the vents from the polymer ocess to condense all the steam and diamine, en- ring that the possibility of odors is eliminated. ntinuously recording smoke detectors are used keep a check on potential air pollutants. equent noise measurements are also made thin and around the plants to ensure that noise is ited to tolerable levels both for the in-plant rk force and for nearby residents. (Sandoski- RL)
76-02798

ANT FOR INDUSTRIAL WATER POLLU- ON CONTROL, (IN JAPANESE),
Yamazaki.
chnical Report of Ishikawajima Harima, p 94- , May 1973. 10 fig, 11 tab.

scriptors: *Waste water treatment, *Industrial stes, *Treatment facilities, Activated sludge, paration techniques, Equipment, Coagulation, y water.
ntifiers: Multi-waveplate separator, Japan.

The IHI-PASSAVANT coagulator, IHI-PASSA-VANT activated sludge treatment apparatus, and the IHI-PASSAVENT multi-waveplate separator have been developed in Japan. The coagulator is a vertical-flow, compound,type, sedimentation apparatus which has the characteristics of high separation efficiency, wide application to a large variety of wastes, possible ejections of sludge and suspended matter, easy maintenance, and low cost. The activated sludge treatment apparatus is the circulation flow type in which the incoming waste water is diluted with a large quantity of water constantly circulating in the basin. This apparatus has wide application to treatment of waste water with different qualities with minimal sludge accumulation. The multi-waveplate separator is used in oil-water treatment. The particle size of the oil to be separated becomes a function of the distance between plates and the plate length. (Seigle-FIRL)
W76-02799

TRAILER-MOUNTED PILOT PLANTS FOR WATER CONSERVATION,
Gulf Research and Development Co., Pittsburgh, Pa.
E. M. Sutphin.
Chemical Engineering Progress, Vol 69, No 8, p 79-80, August, 1973. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pilot plants, Oil industry, Chemical wastes, Treatment facilities, *Water conservation, Design criteria, Engineering.
Identifiers: Refinery wastes.

A forty-foot trailer, housing 18 individual water treating pilot plant modules, has been designed for use in aiding the development of individual treatment systems for chemical plants and refineries. The system provides engineering data on selected water treating processes utilizing the stream to be improved, permits an efficiency evaluation, or the selection and design of the most desirable water treatment system for a particular installation. When used at a refinery or chemical plant site, the trailer allows the plant personnel to actually observe the operation, to change the operation or process flow in any way seen fit, and to evaluate the capability and characteristics of different systems. (Sandoski-FIRL)
W76-02800

LARGEST TREATMENT PLANT FOR METAL FINISHING WASTES.
Industrial Finishing, Vol 49, No 9, p 36-40, September, 1973. 6 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Treatment facilities, Neutralization, Filtration, Oily water, Separation techniques, Sludge treatment.
Identifiers: *Metal finishing wastes.

A two mgd metal finishing waste treatment plant has been constructed by General Electric at Appliance Park East, Columbia, Maryland. In the waste treatment plant, operating since the summer of 1971, acid-alkali wastes flow through a flow meter-equipped pipeline to a trash removing bar screen; through two pH controls to an acid mixing tank; into an API separator; and, to an acid-alkali holding basin for storage. Chromium wastes then flow into a flume and through a trash removing bar screen into a 90,000-gal chromium holding basin. Neutralization occurs when the combined streams flow through a flow meter into a chemical mixing chamber where the pH is adjusted by the addition of lime for optimum dissolved metals precipitation. Powdered activated carbon removes color and organic traces while coagulants and coagulant aids are added to promote clarification in a reactivator clarifier. The clarifier uses internal sludge recirculation in rapid-flow to remove precipitated materials. Clarified effluent flows through a Mono-Pak filter to remove all turbidity. The filtered water is finished by the addition of two ppm dissolved oxygen provided by cascade-type aerators. Clarifier sludge is discharged into a sludge pit, enters a 75 gpm Rota Rake sludge thickener, and then travels to a dewatering centrifuge. Liquid from the thickener and centrifuge is returned to the acid-alkali holding basin for retreatment along with filter backwash water. (Sandoski-FIRL)
W76-02801

CHRYSLER ANNOUNCES PROGRESS WITH IRON-CHIP WATER PURIFICATION METHOD.
Industrial Heating, Vol 40, No 7, p 1260, July, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Iron, Water reuse, Oily water, Dissolved solids, Capital costs, Laboratory tests, Phosphates.
Identifiers: Chromium, *Iron chips, Rotating drum.

Recently conducted experiments have shown that waste water treatment using iron chips holds promise for total water reuse not possible with present technology. The iron chips react with water contaminants to form insoluble products which can be removed by settling and/or filtration. Following initial laboratory work with the iron chips, a pilot plant was established in an engine facility to treat oily waste water. After several days of flowing water from one iron chip-filled cell to another, the chips became coated with oil, reducing the effectiveness of the treatment. The chip-filled cells were then tested as batch processing units. Air was bubbled through the cells filled with waste water, and the water was then drained off. A reduction in dissolved solids was effected but requirements for air made capital costs for this process almost 50% higher than chemical treatment methods. Laboratory studies were conducted to determine if the iron chip process could be used to remove high levels of chromium and phosphate in waste water. A pilot line was established making use of a rotating drum to provide chip movement. However, mechanical difficulties have delayed a complete analysis of this method. (Sandoski-FIRL)
W76-02802

SOME ASPECTS OF A CHEMICAL TREATMENT OF THE WASTE WATERS FROM THE BEAMHOUSE,
Institut INO voor Leder en Schoenen, Waalwijk (Netherlands).
A. J. J. Van Meer.
Journal of the American Leather Chemists, Vol 48, No 8, p 339-345, August, 1973. 7 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Tannery wastes, Organic pollutants, Sludge.
Identifiers: Beamhouse effluents, Acidification.

The reduction of the waste loads from tannery effluents by acidification of the residual beamhouse liquors has been investigated. Findings indicate that the total organic waste load of a chrome leather tannery was reduced about 58% when soaking and unhairing operations were combined. The protein precipitate from combined operations was more amenable to treatment than the normal sludge from tannery effluents. Only about 300-500 gallons per thousand pounds of hides, green weight, had to be treated as compared with much larger amounts for conventional soaking and unhairing procedures. Additional tanning experiments must be performed to prove that this procedure is consistent with a good leather quality. (Sandoski-FIRL)
W76-02803

WAYS TO AN ECONOMIC WATER USE DEMONSTRATED BY THE EXAMPLE OF A

SMALL COTTON DYEING PLANT (WEGE ZUR WIRTSCHAFTLICHEN WASSERVEREWENDUNG AM BIESPIEL EINER KLEINEN BAUMOLLFAERBEREI),
J. Fr. Grugler, and F-R. Preuss.
Wasserwirtschaft-Wassertechnik, Vol 23, No. 7, p 241-244, 1973. 6 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Water reuse, Dyes, Chemical precipitation, Sludge treatment, Landfills, Treatment facilities.
Identifiers: Filter presses, Ferrous sulfate.

Water recycling and waste water treatment adopted at a small-capacity cotton dyeing plant in East Germany, with a view to increasing water shortage and plant expansion, has resulted in the introduction of an adequate pH measurement method and waste water treatment by precipitation with ferrous sulfate for recycling in the flushing process. The hot water used for rapid driers also can be utilized in the high-temperature equipment if it is softened. Boiler vapor condensates are recycled. The sludge from this continuously or intermittently operating waste water treatment plant amounts to 15-18 percent of the total effluent volume and is subjected to gravitational thickening for 20 hours in a thickening tank. Further dehydration prior to disposal on a sanitary landfill is done by means of a chamber filter press. (Takacs-FIRL)
W76-02804

OXYGEN PULP BLEACHING CUTS WASTE EFFLUENTS,
Kaymer, Inc., Glens Falls, N.Y.
G. Rowlandson.
Chemical Engineering, Vol 80, No 20, p 78-79, September 3, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Water reuse, Recycling, Operating costs, Capital costs, Evaporation, Color, *Pulp wastes.
Identifiers: Oxygen bleaching.

A pulp oxygen bleaching unit that will completely recycle its own effluent to the kraft recovery cycle has a bleaching capacity that matches the capacity of the kraft pulping unit it serves. The new plant is owned and operated by La Cellulose d'Aquitaine, located at St. Gaudens, France. The installation of this type of oxygen bleaching unit provides the most economical solution, in terms of operating and capital costs, compared to lime decolorization. Total investment (on an installed basis) for the complete system, including all associated revisions within the pulpmill, was $4.56 million. The pulpmill changes mainly affected multiple-effect evaporators in the black-liquor recovery circuit to eliminate existing sealing problems and to increase capacity by 10 percent. A reduction of 75 percent of the color quantity and 50-70 percent of the chlorides in the combined bleach plant effluent was accomplished. There is no need for a chloride removal system. The equivalent of about 80 pounds of salt cake per ton of pulp is reclaimed. (Sandoski-FIRL)
W76-02805

LIQUID REMOVING METHOD,
R. R. Candor, and J. T. Candor.
United States Patent 3,757,426. Issued September 11, 1973. Official Gazette of the United States Patent Office, Vol 914, No 2, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Separation techniques, Electrodes, *Patents, Pulp wastes.
Identifiers: Electrostatic means, Paper slurry.

A patent has been issued for a process to remove liquid from the paper slurry of a paper making apparatus. The liquid in the paper slurry is removed by an electrostatic means that provides a differential in the potential of the moisture in the paper slurry and an electrode means which causes the moisture in the paper slurry to move toward the electrode means. The electrode means may include a suction nozzle which tends to draw a large volume of air through the paper slurry and to direct the moisture from the paper slurry toward the electrode means. (Sandoski-FIRL)
W76-02806

MODERN DRYING TECHNIQUES IN THE PAPER AND PULP INDUSTRY (MODERN TORKTEKNIK INOM PAPPERS-OCH CELLULOSAINDUSTRI),
K-E. Lindberg, and B. Kaltin.
Modern Kemi, No 6, p 22-27, 1973.

Descriptors: *Drying, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, Evaporation, Incineration, Ion exchange, Chemical oxygen demand, Biochemical oxygen demand, Lignins.
Identifiers: Oxygen bleaching, Uddeholm method, Tampella recovery method.

New pulp drying methods, oxygen bleaching of pulp in an alkaline medium, the Uddeholm process for the treatment of bleaching-generated effluents, and a process applied to black liquor incineration and chemical recovery in a sulfite plup mill, are described. The black liquor from the oxygen bleaching process is similar to that generated by the sulfate process, and thus both types of black liquors can be combined for evaporation, incineration, and the recovery of chemicals. A 300 ton/day capacity ion exchange unit adopting the Uddeholm method has been used successfully for several months for the treatment of effluents from the first alkaline bleaching stage. The dye concentration, as well as the COD and BOD values of the effluent, are reduced by the ion exchanger by more than 90 percent, 70 percent, and 30 percent, respectively. Nearly quantitative removal of lignin and chlorides is achieved by the Uddeholm Color Removal Process. In a large-capacity sulfite pulp mill in Valkaekoski, Finland, cooking has been converted from a calcium to a sodium disulfite process, which evaporates and incinerates part of the black liquor together with the sulfate pulp black liquor. According to the Tampella recovery method, sulfur is separated from the incinerator soda lye in the form of hydrogen sulfide with soda remaining as a residue. The generated hydrogen sulfide is burned to obtain sulfur dioxide. (Takacs-FIRL)
W76-02807

TREATMENT OF EFFLUENT IN POULTRY PROCESSING.
FMF Review, p 24, July, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Poultry, Biological treatment, Plastics, Filters, Food processing industry, Dairy industry.
Identifiers: Biofilters, Flocor.

At the poultry processing factory of J. P. Wood and Sons Limited, Craven Arms, England, it has been the practice to dispose of the effluent by spraying it over a large area of unused land which resulted in its progressive saturation. Authorities agreed that this method was no longer acceptable and that some form of biological treatment would be necessary. The full biological treatment plant constructed comprised screening, fat trapping, and roughing treatment over a two-pass unit in-loop settlement followed by polishing by a single-pass conventional percolating filter. The design for a treatment plant at the Express Dairy, Tarrin, Chester, incorporated a new fat trap and additional balancing facilities, followed by bio-towers utilizing 'Flocor' plastics filter as the bio-medium, with in-loop settlement, and finished by polishing over conventional percolating filters operated as ADF. The resultant effluent was lower than the Royal Commission 20/30 standard. (Sandoski-FIRL)
W76-02808

MICROBIAL TREATMENT OF INDUSTRIAL WASTES: TREATMENT OF FODDER YEAST WASTE.
Taiwan Sugar Experiment Station, Annual Report p 33-34, 1971-1972. 1 fig, 3 tab.

Descriptors: *Biological treatment, *Waste water treatment, *Industrial wastes, Waste disposal, Anaerobic digestion, Yeast, Chemical oxygen demand, Biochemical oxygen demand, Aerobic conditions, Methane, Activated sludge.
Identifiers: Fodder yeast wastes.

The disposal of waste from the Fodder Yeast Factory of the Taiwan Sugar Company creates a problem because of the large quantity, high BOD and COD concentrations, and deep brown staining. Anaerobic (methane fermentation) and aerobic treatments (activated sludge process) were applied to reduce the BOD value of the waste. A12(SO4)3 and FeC13 were used to decolorize the digested fluid. In the case of anaerobic treatment, an effective treatment could be obtained by increasing the sludge concentration from 5 to 20 volume-percent. In the aerobic tests, the yeast waste fluid was first diluted with water and then treated by activated sludge in shaking flasks. The optimum conditions for removing BOD and COD at 30 C were an aeration rate of 5.5 x 10 to the minus 7th power in Kd value by sodium sulfite method, a pH value of 7.0, and a six percent sludge concentration after centrifugation at 3,000 rpm for five minutes. It was found that the transmittance of the diluted digestive fluid at 440 mu could be increased from 11 to 69 percent when 2,000 mg A12(SO4)3 was added to 1,000 ml of the diluted fluid. For FeC13, the transmittance reached 86 percent when 1,500 mg was added to the diluted fluid. (Sandoski-FIRL)
W76-02809

METHOD FOR DETERMINATION OF ACRYLONITRILE AND ACETONITRILE IN WASTE WATERS (METODA PENTRU DETERMINAREA ACRILONITRILULUI SI ACETONITRILULUI IN APEL REZIDUALE),
For primary bibliographic entry see Field 5A.
W76-02810

TREATMENT OF INDUSTRIAL WASTE SOLUTIONS AND PRODUCTION OF USEFUL BY-PRODUCTS USING A PHOTOSYNTHETIC BACTERIAL METHOD,
Kyoto Univ., (Japan). Dept. of Agricultural Chemistry.
M. Kobayashi, and Y. T. Tchan.
Water Research, Vol 7, No 8, p 1219-1224, August, 1973. 1 fig, 5 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Bacteria, Algae, Microbial degradation, Chlorophyta, Recycling, Waste disposal, Fertilizers, Foods, Fish diets, Poultry, Agriculture.
Identifiers: *Photosynthetic bacteria method.

The purification of some industrial waste water by photosynthetic microbes has been studied. The by-products of the treatment, photosynthetic bacteria and green algae, were used as food for animals and fish, and as a fertilizer. The survival rate of carp fry was significantly higher in the group fed with photosynthetic bacteria (PSB). The effect of PSB on egg laying is commercially important. In six months, the treated group of birds produced 3708 more eggs than the control group. The use of PSB cells as a fertilizer for mandarin production showed an increase in the number of fruit per tree, and the average fruit was heavier, sweeter (increased in sugar content), and more attractive in appearance (increased in carotenoid pigments). The total increase in yield of fruit was 1152 kg. The results from these experiments indicate that the by-products from this process are valuable, per-

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nitting the recycling of waste products into food roduction. The elimination of sludge in this treatent is also important, especially in areas where isposal of sludge is difficult. The by-products rom this treatment are easily transportable since SB and algal cells can both be dried and packed or shipment. This allows the use of these products distant rural areas away from the production enters. (Sandoski-FIRL)
V76-02811

ILTER HAVING A FLEXIBLE WALL FOR ILTERING LIQUIDS,
. Fournier.
ustralian Patent 44,975. Applied June 18, 1970. ssued February 7, 1974. Official Journal of atents, Trade Marks, and Designs, Vol 44, No 4, 385, February 7, 1974.

escriptors: *Patents, *Filter, *Flexibility, Liquid wastes, Separation techniques, Equipent, Operation, *Waste water treatment.
dentifiers: Suction.

filter with a flexible wall for filtering liquids is escribed. It consists of two discs, one of which is onnected to a support and which has a fluid outlet erature connected as a means of suction. The econd disc member is coaxial with an axially ovable relative to the first disc member. A flexie filter sleeve extends between the two discs and connected to them. There is a gravity activated allast means which biases the discs away from ach other and tenses the flexible filter sleeve to pproximately cylindrical form when no suction is pplied. The discs flex inwardly when the apratus is immersed in a fluid-containing solids. he solids are deposited on the filer filter when iction is applied. (Merritt-FIRL)
76-02813

FFLUENT SLUDGE TREATMENT.
etherlands Patent 7,304,173. Applied March 26, 73. Issued February 14, 1974. Derwent Netherds Patents Report, Vol 5, No 9, p 2, April, 1974.

escriptors: *Patents, *Sludge treatment, Chemil precipitation, Effluents, Proteins, Acidity, Vaste water treatment.
entifiers: *Wet scrubbers, *Combustion gases, lfur dioxide, Sulfur trioxide, Hydrogen loride, Hydrogen fluoride.

ffluent sludge is treated by passing it through a rubber or other wet washing process which ineases the surface area by contacting it with comstion gases at 600-800 C. The gases are made by oxide, hydrogen chloride and small amounts of drogen fluoride, so that the effluent is acidified d proteinaceous material is precipitated. The mperature is preferably less than 50 C during the atment. The process allows treatment of efent sludges containing about 99 wt % of water thout using conventional precipitating agents. erritt-FIRL)
76-02814

N EXCHANGER PURIFICATION PLANT.
ench Patent 2,186,289. Applied June 1, 1973. Ised February 15, 1974. French Patents Abstracts, l5, No 10, p 2, April 1974.

scriptors: *Patents, *Sewage treatment, *Ion change, *Waste water treatment, Cellulose, Oric wastes, Mixing.

ion exchanger purification plant is described in ich the liquid to be purified is mixed thoroughly a variety of mechanical methods. The mixing urs in treatment tanks in series and/or parallel h granulated activated regenerated cellulose or lulose derived material. The ion exchanger cess extracts the unwanted impurities from the id which is then separated again by a variety of thods from the ion exchanger material. A part at least of those impurities are then stripped out of the exchanger material by regeneration expecially using the same activator as that used initially and the regenerated ion exchanger wholly or partially fed back into the plant for reuse after being flushed through. The plant is especially useful for removal of animal and vegetable matter from sewage. (Merritt-FIRL)
W76-02815

MULTIPLE RE-USE OF WATER,
W. H. Champman, and J. F. Eichelmann.
Canadian Patent 944, 875. Applied March 8, 1971. Issued April 2, 1974. Patents/Brevets, Vol 102, No 14, p 1224, April 2, 1974.

Descriptors: *Patents, *Waste water treatment, *Demineralization, *Water reuse, Mineralogy, Saline water, Water purification, Brackish water, Water pollution control, Waste water disposal, Effluents, Industrial water, Potable Water, Irrigation, Municipal water, Water supply, Water supply resources, Evaporation, Canada.

A process for the treatment of saline, brackish or other high mineral content water to provide effluent waters for domestic and industrial usage and for the treatment of the domestic and industrial waste water for multiple reuse so as to solve both water supply and waste water pollution problems is described. A demineralization system is combined with a system utilizing a relatively nonvolatile fluidizing liquid and capable of operating on a waste waters of relatively high solids content. The latter system receives high mineral content effluent from the demineralizer as well as waste water from the industrial and/or domestic sources. Potable water and low mineral content waters for industrial use are produced and substantially all water is reused except that lost by evaporation to the atmosphere or by use in irrigation. The system is particularly well adapted for small communities having an adjacent industrial plant. (Merritt-FIRL)
W76-02816

PREPARATION OF ION EXCHANGE RESINS BASED ON AGAROSE.
German patent 1,916,107. Applied March 28, 1969. Issued February 28, 1974. German Patents Abstracts, Vol 5, No 10, p 1, April, 1974.

Descriptors: *Ion exchange, *Resins, Proteins, Viruses, Enzymes, *Waste water treatment.
Identifiers: *Agarose, Nucleic acids, Nucleotides, Nucleoprotides.

Basic ion exchange resins are prepared from agarose or cross linked glyceryl agaroses by treatment with equimolar amounts of epichlorhydrin and triethanol-amine in a basic medium for 30 min at 75-80 C. The products are useful for the isolation and purification of viruses, proteins, nucleic acids, nucleotides, nucleoprotides, and enzymes. (Merritt-FIRL)
W76-02817

ACTIVATED SLUDGE TREATMENT IN TANK AERATOR.
Belgium Patent 806,582. Applied October 26, 1973. Issued February 15, 1974. Derwent Belgium Patents Report, Vol 5, No. 10, p 2, April, 1974.

Descriptors: *Sludge treatment, *Patents, Activated sludge, Pump, Nozzle, Sewage, Oxygenation, Agricultural wastes, Venturis, *Waste water treatment.
Identifiers: *Aerator.

An activated sludge treatment tank aerator is described which used multiple jet pumps driven by a common rotary pump. Either an external electric motor driven impeller pump with suction side connected to the lower part of the circular treatment tank, or an immersed pump may be used. From the delivery side of that pump either a curved horizontal pipe or the body of the main immersed pump, feeds a number of radially spaced nozzles in the form of Venturis, so that turbulence is created in the tank contents. Each Venturi has a vertical air inlet pipe at its throat leading to above the maximum liquid level especially above the tank roof. Thorough mixing of activated sludge with the sewage especially farmyard, combines with oxygenation. (Merritt-FIRL)
W76-02819

ACTIVATED SLUDGE WASTE WATER PURIFIER.
Belgian Patent 806,205. Applied October 17, 1973. Issued February 15, 1974. Derwent Belgian Report, Vol 5, No 9, p 2, April, 1974.

Descriptors: *Patents, *Waste water treatment, *Water purification, Equipment, *Activated sludge, Sludge treatment, Domestic wastes, Industrial wastes, Effluents, Aeration, Underground structures.

An activated sludge waste water purifier is described which combines blower aeration and stabilizing vessels in a single underground tank. Domestic or industrial waste water is treated in order that it may be discharged as an effluent without pollution hazard into a cylindrical underground tank. The tank is divided into an aerating section and a stabilizing section and separated by a partition penetrated by a pipe leading to the liquid surface. The installation preferably has a manhole, covered by a metal grid which provides access to the blower and both sections of the tank. Water is fed to one end of the tank in aeration section, and pure water is recovered via perforated surface collection pipes. The unit may be installed close to residences, is not noisy, and is not susceptible to contamination with vegetation. (Merritt-FIRL)
W76-02820

CISTERN.
For primary bibliographic entry see Field 8C.
W76-02821

AEROBIC DRYING OF ORGANIC WASTE,
H. Gujer.
Australian Patent 445,094, Applied December 2, 1968, Issued February, 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 5, p 460-461, February, 1974.

Descriptors: *Waste water treatment, *Patents, *Aerobic conditions, *Dewatering, *Organic wastes, Water drying.

An aerobic method for continuously dewatering organic waste matter of a water content of more than 40% by weight is described. Aerobic precomposting proceeds to a water content permitting aerobic compositing of the water waste matter while simultaneously precomposting the waste matter arranged in a bed of substantially uniform thickness. The waste matter with more than 40% by weight water is periodically admixed through proportionately progressive addition to the total bed mass which consists essentially of precomposted waste matter of the same type, in a maximum quantity of 20% by weight of the bed mass per day. The entire bed mass is circulated several times daily during the continuous precomposting process and as much precomposted, dewatered waste matter is removed from the process as new waste matter of a water content of more than 40% by weight is added. (Merritt-FIRL)
W76-02822

EFFLUENTS BIOCHEMICAL PURIFICATION,
D. N. Smirnov, A. S. Dmitriev, and R. T. Gumbatov.

Soviet Patent 385,929, Applied February 18, 1971, Issued September 20, 1973. Soviet Inventions Illustrated, Vol 5, No 9, p 2-3, April, 1974. 1 fig.

Descriptors: *Patent, *Waste water treatment, *Maintenance, Activated sludge, Monitoring, Drainage water, Aeration, Water level, Automatic control, Tanks, Valves.

The maintenance of a stable purification process is controlled by continuous monitoring of oxidation regeneration potential of drainage water flowing into aeration tanks and recirculation of sludge and supply of air into the tank automatically adjusted in accordance with test results. The concentration of contaminated drainage water is checked by test unit which is used to control the air flow through a valve. The test unit is also used to control the water level in the sedimentation tank. Sludge in the tank is recirculated through a regulated valve to the tank. (Merritt-FIRL)
W76-02823

PURIFYING POLLUTED EFFLUENT,
V. Stengelin.
Netherlands Patent 7,310,800, Applied August 3, 1973, Issued February 7, 1974. Derwent Netherlands Patents Report, Vol 5, No 8, p 3, March, 1974.

Descriptors: *Patents, *Separation technique, *Waste water treatment, Effluent, Water pollution treatment.

A separation technique for purifying polluted effluent is described. The incoming effluent is split into two fractions of which the major, about 80-95% of the whole, is put into the first stage while the balance of untreated effluent is divided between the second and subsequent stages. This increases the decomposition rate in later stages. (Merritt-FIRL)
W76-02825

LOW-TEMPERATURE PURIFICATION OF FLUIDS,
G. E. Hays, and M. A. Albright.
Canadian Patent 943,055, Applied May 10, 1971, Issued March 5, 1974. Patents/Brevets, Vol 102, No 10, p 839, March, 1974.

Descriptors: *Waste water treatment, *Patents, *Absorption, Liquids, Gases, Streams, Temperature.

An absorption process for the low temperature purification of fluids is described. Liquids or gas streams are purified at a temperature at or below the freezing point of the constituents to be purified. Operating at or below that temperature greatly increases the adsorption capacity of the adsorptive material. (Merritt-FIRL)
W76-02827

FILTERING PROCESS,
J. Goldfield, and V. Greco.
Canadian Patent 943,079, Applied March 16, 1971, Issued March 5, 1974. Patents/Brevets, Vol 102, No 10, p 844, March, 1974.

Descriptors: *Waste water treatment, *Patents, *Filtration, *Filters, Liquids, Solid wastes, Gases, Pressure.
Identifiers: Submicron particles.

A process for filtration of submicron liquid and solid particles from large volumes of gas in which the particles are carried is described. The gas is passed through a filter medium made up in fibers having an average diameter of up to about 10 micron at a velocity of at least 300 ft/min and at a pressure drop not greater than 40 inches of water to remove at least 80% of such particles. (Merritt-FIRL)
W76-02828

WATER PURIFICATION.
For primary bibliographic entry see Field 5F.
W76-02829

LIQUID WASTES TREATMENT METHOD,
J. O. H. Cessna.
Canadian Patent 945,695, Applied September 16, 1971, Issued April 16, 1974. Patents/Brevets, Vol 102, No 6, p 1404-1405, April, 1974.

Descriptors: *Patents, *Liquid wastes, *Clarification, *Waste water treatment, *Aeration, *Recycling, Flow, Filters, Sludge, Activated sludge, Solids, Biological treatment, Suspended solids, Effluents, Secondary treatment, Primary treatment, Mixing, Canada.

A two stage high-rate, activated biological filter system is used, involving a primary clarifier for treatment of liquid wastes. Activated floc and biological slime are sloughed off from the biological filter and returned to a primary clarifier. The activated floc is built up in the biological filter by the recycling of substantial quantities of aerobic sludge from a secondary clarifier to the biological filter and by the metering of solids wasted from the treatment system. This maintains the mixed liquor, suspended solids level in the filter effluent in excess of about 1500 mg/liter. Underdrain flow from the secondary clarifier is a substantial percentage of plant influent flow. This is recycled without extended mixing with plant influent or aeration prior to distribution over the biological filter. (Prague-FIRL)
W76-02832

CARBON-CONTAINING WASTE WET-OXIDATION.
Netherlands Patent 7312-989, Applied September 20, 1973, Issued April 2, 1974. Derwent Netherlands Patents Report, Vol 5, No 16, p 1, May, 1974.

Descriptors: *Patents, *Municipal wastes, *Carbon, *Oxidation, Gas, Ecological effects, Effluents, Sewage, Dispersion, *Waste water treatment.
Identifiers: *Carbon-containing wastes, *Wet-oxidation.

A horizontal reactor is subdivided into several cylindrical, interconnected compartments for the wet-oxidation of carbon-containing waste material. This process involves contacting an aqueous dispersion of the waste material within an oxidizing gas. The dispersion is introduced continuously into one end of the minutes, dispersion is kept at acid pH (2-7) and 204 C to 246 C. Rapid oxidation of the carbon-containing waste material is effected by strong stirring, movement, and distribution of the oxidizing gas, and thus forms an ecologically acceptable effluent. This process is suitable for municipal and small-scale sewage processing. (Prague-FIRL)
W76-02833

AERATION PLANT FOR LIQUIDS.
Belgian Patent 807-372, Applied November 16, 1973, Issued March 15, 1974. Derwent Belgian Patents Report, Vol 5, No 14, p 3, March, 1974.

Descriptors: *Patents, *Aeration, *Liquids, *Waste water treatment, *Sewage treatment, Maintenance, Treatment facilities, Air.
Identifiers: *Compressors.

Waste water and sewage are treated by aeration with compressors operating below the liquid surface. The plant has a main air pipe and branch pipes which lead to this aerator, each provided with perforations through which air can escape. At regular intervals the air feed pipes are connected to the main feed and supplied with compressed air by a motor driven machine. This compressor assembly is mounted on slides so that it can be lifted clear of the liquid for maintenance. Since the compressors operate below the liquid surface, no cooling systems are needed and noise is reduced. (Prague-FIRL)
W76-02834

WASTE WATER TREATMENT PLANT.
French Patent 2191-945, Applied July 17, 1972, Issued March 15, 1974. French Patents Abstract, Vol 5, No 14, p 2, March, 1974.

Descriptors: *Patents, *Waste water treatment, *Treatment facilities, *Flotation, *Aluminum, Sewage, Precipitation, Sludge, Syphoning, Aerobic treatment, Effluents, Design, Separation Equipment.
Identifiers: Aluminum amalgam, Microbubbles.

Non-biodegradable impurities in effluents are separated by flotation methods using microbubbles of hydrogen produced by the reaction of water with activation aluminum. Impurities are skimmed from the surface while cleared water is extracted by syphoning. The plant design is a single flotation tank with a sump for heavy precipitated sludge. The raw sewage inlet is at about half the height of one side wall with plates of activated aluminum amalgam being placed below the level of the inlet. Overflow runoff for any partly treated effluent can be further treated by aerobic methods. (Prague-FIRL)
W76-02835

FLUIDISED BED REACTOR.
Australian Patent 447,304, Applied January 12, 1970, Issued April 11, 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 13, p 1343, April, 1974.

Descriptors: *Patents, Equipment, *Liquids, Gas, Waste water treatment.
Identifiers: *Fluidised bed reactor.

A fluidised bed reactor comprises a vessel and has a base arranged to support a bed of particulate material within the vessel. This is formed with a multiplicity of perforations for the admission of fluidising gas, conduit means for supplying fluidising gas to the reactor, a first set of tubes of which each tube communicates at one end with the supply conduit means, and a closable valve located between the supply conduit means and the orifice. Openable closure means are located on the side of the orifice, remote from the supply conduit means. The closure means are arranged to permit clearing of the orifice when the closure means is open. A second set of tubes is provided. The number of tubes in each set is equal to the number of perforations and each tube of the second set has a closable valve and communicates at one end with a different one of the tubes of the first set. (Prague-FIRL)
W76-02836

SEWAGE AND INDUSTRIAL WASTE COAGULATION.
Australian Patent 444,072, Applied September 14, 1972, Issued January 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 1, p 34, January, 1974.

Descriptors: *Dewatering, *Sewage, *Industrial wastes, *Patents, Polymers, Floc, Solids, Municipal wastes, *Coagulation, *Waste water treatment.
Identifiers: Water-in-oil emulsions, Latex.

A method of thickening or dewatering solids from municipal sewage or industrial wastes has been patented. It includes the addition of an aqueous solution of a water-soluble vinyl addition polymer, by the inversion of a polymeric latex, to sewage under floc forming conditions. The solids are allowed to settle from sewage to provide a clear aqueous supernate, where polymeric latex is

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produced by the steps of forming a water-in-oil emulsion and heating emulsion under free radical forming conditions to polymerize the water-soluble ethylenic unsaturated monomer forming a polymeric latex. (Prague-FIRL)
W76-02837

WATER PURIFICATION COAGULANT PRODUCTION,
L. A. Kulskii, M. I. Dontsova, and M. I. Medvedev.
Soviet Patent 357,808, Applied July 7, 1969, Issued August 31, 1973. Soviet Inventions Illustrated, Vol 5, No 6, p 1, March, 1974.

Descriptors: *Water purification, *Coagulation, Sludge, Inorganic acid, *Patents, *Waste water treatment.

The preparation of an active, hygienic, and economical coagulant to be used in water purification is described. A mineral acid is added to a water purification process sludge until the hydroxide gel is converted to a solution. The sediment is separated from the solution, and the organic matter is oxidized. The point at which the gel becomes a solution is determined by potentiometric or conductivity measurements. The oxidation of organic material is preferably carried out with a powerful oxidizer so that the solution is completely decolorized. In an example, 0.5 liters of mud obtained from a water purification process is treated with 1 liter amounts of 0.1 N HCl after 20 min, and then five times every subsequent hour, then after 3 days, and after 1 mo and 8 days. The degree of peptization is determined from the amount of insoluble sediment resulting. The coagulant obtained is treated with ozone and its technological properties are tested. (Merritt-FIRL)
W76-02839

WASTE WATER PURIFICATION.
French Patent 2,177,843, Applied March 23, 1973, Issued November 9, 1973, French Patents Abstracts, Vol 5, No 1, Feb 7, 1974, p 7.

Descriptors: *Sewage treatment, *Waste water treatment, *Water purification, *Suspended solids, *Nitrogen, Adsorption, Activated carbon, Aerobic conditions, Nitrates, Separation, Techniques, Oxidation, Denitrification, Nitrites, Sedimentation, *Patents.
Identifiers: Methanol.

A method of purification of sewage and other waste water is described which comprises removal of suspended solids and decomposition of nitrogen containing substances. An adsorbent, preferably powdered activated carbon, and an oxygen containing gas are introduced into a reservoir in which the waste water and a growing biomass have been stored for 3 days. Aerobic conditions are maintained until the whole ammonical nitrogen is oxidized to nitrites or nitrates. The solids are separated by sedimentation. The liquid phase is passed into an anaerobic zone to which another portion of the adsorbent and an organic carbon source, preferably methanol, is added. The nitrites and nitrates are reduced to elemental nitrogen and the solids are separated by sedimentation. High rates of denitrification are achieved. (Merritt-FIRL)
W76-02840

TREATMENT OF INDUSTRIAL EFFLUENTS.
Netherlands Patent 7,310,574, Applied July 31, 1973, Issued February 4, 1974. Derwent Netherlands Patents Report, Vol 5, No 7, p 3, March, 1974.

Descriptors: *Nitrogen, *Nitrates, *Nitrites, Industrial wastes, Effluents, Carbonates, Minerals, Denitrification, Activated sludge, Waste water treatment, Chemical wastes, Patents.

The treatment of industrial aqueous effluents of pH less than 6.0 containing nitrogenous and carbonated minerals is described. The effluent is entered into an anaerobic zone of treatment containing an anaerobic activated sludge at a rate of flow so that the concentration of nitrate and nitrite ions in the treatment zone are held at low values, less than 3 mg/liter, preferably less than 1 mg/liter. The effluents from the anaerobic zone are pumped to a second treatment zone which may be clarification zone or an aerobic treatment zone. The treatment effluent may be recycled. The process is applicable for the treatment of industrial effluents, particulary from chemical works as from nylon production. The nitrogen content is reduced to a very low figure. (Merritt-FIRL)
W76-02841

AERATOR.
French Patent 2,184,068, Applied May 10, 1973, Issue date not given. French Patents Abstracts, Vol 5, No 7, p 3, March, 1974.

Descriptors: *Activated sludge, *Effluents, *Waste water treatment, Aeration, Equipment, *Patents.
Identifiers: Aerators.

A rotatable, biological surface contact aerator is described for treating activated sludge effluent. It has a series of elements mounted on and spaced along a shaft and is partly emmersed in the effluent to be purified. The elements are a series of discs delimiting both a number of mutually spaced, separate internal coaxial channels opening at each end into a radial channel. Adjacent discs delimit and extra series of separate, coaxial channels also opening at each end into a radial channel. (Merritt-FIRL)
W76-02842

SEWAGE PHOSPHATES EXTRACTION.
French Patent 2,183,605, Applied May 12, 1972, Issued December 21, 1973. French Patents Abstracts, Vol 5, No 7, p 1, March, 1974.

Descriptors: *Waste water treatment, *Sewage treatment, *Phosphates, Activated sludge, Separation techniques, Recycling, Effluents, *Patents.

An extraction method for sewage phosphates is described which uses activated sludge. Raw sewage is passed through a presedimentation tank and then mixed with activated sludge. The resultant slurry is stored in an aeration tank for 1-8 hr where the microorganisms in the activated sludge digest the phosphates being precipitated. The slurry then passes to a sedimentation tank where the phosphated sludge is fed to a stripping tank into which a stoichometric quantity of phosphate stripping and dissolving agents is fed so that the sludge can be recycled. The effluent from the final separator can be passed for subsequent treatment and has significantly reduced BOD. (Merritt-FIRL)
W76-02843

NATURAL FERTILIZER PRODUCTION,
B. P. Kratzer.
Derwent Belgian Patents Report, Vol 5, No 6, p 1, March 14, 1974. Belgian Patent 805,042, Applied September 19, 1973, Issued January 16, 1974.

Descriptors: *Patents, *Fertilizers, *Farm wastes, *Waste water treatment, Hydrogen ion concentration, Separation techniques, Application methods.

The fertilizer is prepared from mixtures of aqueous waste and animal excrement by adjusting the pH of the animal excrement, optimally after mixing with water, to 0.1-2 with mineral acids and agitating the mixture to disintegrate it for 24 to 60 hours separating the liquid phase from the solid material and adjusting the pH of the liquid at least pH 5. Said fertilizer is suitable for domestic gardens, horticultural, and agricultural use. It has no odor, is hygienically acceptable, and is storage stable. (Sandoski-FIRL)
W76-02844

AERATION TANK,
A. S. Dolobovskaya, M. I. Nevzorov, and I. A. Sherenkov.
Soviet Inventions Illustrated, Vol 5, No 5, p 1, March 7, 1974. USSR Patent 381,611, Applied May 22, 1973, Issued August 14, 1973.

Descriptors: *Aeration, Treatment facilities, *Storage tanks, *Waste water treatment, *Filters, Screens, *Sludge treatment, *Patents.

The system consists of a rectangular storage tank fitted with filters, water admission and withdrawal channels, sludge-duct, and screens. The mass-transfer conditions are improved and the purifying process is intensified by creating flows of air and water in opposite directions, the screens in pairs forming diffusers. The sludge mixture is continuously circulated from the bottom of the tank via adjacent corridors along the diffusers upwards and passed into the corridors from above. In this way the sludge mixture comes downwards against the rising flow of air coming in through the filter channels. (Sandoski-FIRL)
W76-02845

SEWAGE AERATION TURBINE.
Derwent Belgian Patents Report, Vol 5, No 6, p 2, March 14, 1974. Belgian Patent 805,018, Applied September 19, 1973, Issued January 16, 1974.

Descriptors: *Venturi flumes, *Patents, *Axial flow turbines, Aeration, *Sewage treatment, Cavitation, *Waste water treatment.

The blades of the axial flow turbine are closely surrounded by the throat of the Venturi tube and at least some of them are hollow with orifices at their tips. The drive shaft from the external motor also is hollow and has holes in its walls loading to an annular space connected by one or more pipes to the atmosphere. The number and shape of blades and the motor speed produce safer cavitation at the tips. (Sandoski-FIRL)
W76-02846

FURNACE FOR BURNING SEWAGE AND LIKE RESIDUES,
Lucas Furnace Developments Ltd., Wednesbury (England). (Assignee).
For primary bibliographic entry see Field 5E.
W76-02847

TREATMENT OF AN AQUEOUS WASTE STREAM CONTAINING AMMONIUM HYDROXIDE,
P. Urban, and R. H. Rosenwald.
Canadian Patent 941,528, Applied October 23, 1970, Issued February 5, 1974. Patents/Breves, Vol 102, No 6, p 513, February 5, 1974.

Descriptors: *Industrial streams, *Ammonia, Sulfur, Oxygen, Hydrogen, Catalysts, *Effluent streams, *Waste water treatment, *Patents.
Identifiers: *Ammonium hydroxide.

The treatment of an aqueous waste stream containing ammonium hydroxide to produce elemental sulfur and ammonia is described. The aqueous stream is catalytically treated with oxygen at oxidizing conditions effective to produce an effluent stream containing ammonium hydroxide (NH4)2S203, and elemental sulfur or ammonium polysulfide. The sulfur and ammonia are separated from the effluent stream containing (NH4)2S203. That stream is catalytically treated with hydrogen at reduction conditions effective to form a substantially thiosulfute free aqueous stream. (Merritt-FIRL)
W76-02850

DRAINAGE BODY AND BIOLOGICAL FILM SUPPORT,
H. Geiger.
Belgian Patent 802,025, Applied July 20, 1972, Issued November 5, 1973. Derwent Belgian Patents Report, Vol 5, No 1, p 4, February 7, 1974.

Descriptors: *Sewage treatment, *Drainage area, Microorganisms, *Biological treatment, Biodegradation, *Waste water treatment, *Patents.

A drainage body and biological film support for sewage treatment are described. The drainage body consists essentially of an assembly of elements having a large surface area which serves for the growth of the biological film. At infrequent intervals this film is detached, independently of the water and sewage feed, by means of scrapers. This is done before the mass becomes detached by itself so that it is not entrained in the water. Regular operation of the drainage body and maximum degradation of the sewage is obtained in minimum possible space and with the largest possible purification capacity. (Merritt-FIRL)
W76-02851

CHAIN EXTENDED POLYELECTROLYTE SALTS AND THEIR USE IN FLOCCULATION PROCESSES,
E. Witt.
Canadian Patent 941,539, Applied May 17, 1971, Issued February 5, 1974. Patents/Brevets, Vol 102, No 6, p 516, February 5, 1974.

Descriptors: *Polyelectrolytes, *Flocculation, Nitrogen, Polymers, Water purification, Clays, Sewage treatment, Dispersion, *Waste water treatment, *Patents.

The preparation of chain extended polyelectrolyte salts is described for use in flocculation processes. Water soluble poly (quaternary ammonium) polyether polyelectrolyte salts containing quarternary nitrogen atoms in the polymer backbone and chain extended by ether groups are prepared by treating the polymeric reaction product from an N,N,N', N'-tetraalkyl-hydroxy substituted diamine and an organic dihalide such as a dihaloalkane or a dihalo ether with and epoxyhaloalkane. These polyelectrolytes are used in processes for flocculating particles dispersed in aqueous media, e.g., white water clarification, clay flocculation, sewage treatment, and wet-end addition, by adding the polyelectrolyte to the aqueous media in amounts sufficient to flocculate the dispersed particles. (Merritt-FIRL)
W76-02852

WATER TREATMENT ION-EXCHANGE VESSEL,
J. P. Madern.
French Patent 2,179,573, Applied April 10, 1972, Issued November 23, 1973. French Patents Abstracts, Vol 5, No 3, p 1, February 21, 1974.

Descriptors: *Filters, Water treatment, *Ion exchange, Water purification, *Resins, *Waste water treatment, *Patents.
Identifiers: Backwash.

A water treatment ion exchange vessel is described which continuously regrades the resin bed by circulating resin material. Water for treatment is brought in at the bottom of the vessel where it passes through an ejector to entrain bed material which is carried up a vertical pipe to be returned to the top of the bed while the water runs down through the bed. Back washing is eliminated. The vessel can also be used as a granular filter unit. (Merritt-FIRL)
W76-02855

SEWAGE TREATMENT PLANT,
J. R. Kaelin.
Belgian Patent 801,708, Applied July 2, 1972, Issued October 15, 1973. Derwent Belgian Patents Report, Vol 5, No 1, p 3, February 7, 1974.

Descriptors: *Recirculated water, *Sewage treatment, *Biodegradation, Aerobic conditions, Activated sludge, Sewage systems, Facilities, *Waste water treatment, Effluent, *Patents.

A sewage treatment plant with partial recirculation is described which uses aerobic biodegradation. A central closed top cylindrical mixer tank is subdivided by concentric cylindrical walls, and is staggered in height to form an elongated zigzag path for raw sewage fed into the outer annulus of the mixer tank at its top and pretreated with injected pure oxygen or gas mixture containing it. From the base of the center compartment of the mixer tank, a number of pipes lead to the base of an outer concentric buffer tank and discharge in a peripheral direction into that buffer tank. A limited feedback of liquid with activated sludge is taken from the surface of the buffer tank into the mixer and treated effluent is extracted from the buffer tank. (Merritt-FIRL)
W76-02856

WASTE WATER PURIFICATION,
M. J. O. Siren.
French Patent 2,177,843, Applied March 21, 1973, Issued November 9, 1973. French Patents Abstracts, Vol 5, No 1, p 7, February 14, 1974.

Descriptors: *Sewage treatment, *Water purification, *Suspended solids, Nitrogen, Adsorption, Activated carbon, Aerobic conditions, Nitrates, Separation techniques, Oxidation, *Denitrification, Nitrites, Sedimentation, *Waste water treatment, *Patents.
Identifiers: Methanol.

A sewage and waste water purification method is described which comprises removal of suspended solids and decomposition of nitrogen containing substances. An adsorbent, preferably active carbon, and an oxygen containing gas are introduced into a reservoir in which the waste water and a growing biomass have been stored for > or = 3 days. Aerobic conditions are maintained until the whole ammoniacal nitrogen is oxidized to nitrites or nitrates. The solids are separated by sedimentation and the liquid phase goes into an anaerobic zone to which more adsorbent and an organic carbon source, preferably methanol, are added. The nitrites and nitrates are reduced to elemental nitrogen and the solids are separated by sedimentation. High rates of denitrification are achieved. (Merritt-FIRL)
W76-02858

LIQUID WASTE STABILIZATION PLANT.
French Patent 2,179,712, Applied December 29, 1972, Issued November 23, 1973. French Patents Abstracts, Vol 5, No 3, p 1, February 21, 1974.

Descriptors: *Recirculated water, Sewage, Sludge, Sewage treatment facilities, Liquid wastes, Stabilization, *Waste water treatment, *Patents.

A two stage liquid waste stabilization plant with massive recirculation capabilities is described. Each stage is a discrete tank, free from internal obstacles and connected in cascade with a feedback from the intertank connection via an injector for oxidizing agent to the suction side of the main feed pump for sewage or sludge into the first stage. Approximately 85% (> or = 75%) of the flow from the first stage tank is recirculated. For maximum efficiency the first stage tank is recirculated. For maximum efficiency the pressure in the first stage is maintained at one level by the throttling effect of the jet pump and in the second stage at another level by a reverse pressure centrifugal pump in its outlet side. (Merritt-FIRL)
W76-02860

SEWAGE TREATMENT.
French Patent 7,205,271, Applied August 1, 1972, Issued October 15, 1973. French Patents Abstracts, Vol 5, No 2, p 1, February 4, 1974.

Descriptors: *Sewage treatment, *Separation techniques, *Recycling, Disinfection, Water purification, Liquid wastes, Solid wastes, *Waste water treatment, *Patents.

A sewage treatment is described in which the sewage is flushed from several receivers to form a mixture of liquid and sewage. The mixture is separated into high solid content and high liquid content proportions. The solid matter is separated from the liquid in the part with high liquid content. A chemical composition is maintained in the liquid so that the liquid is a disinfectant and deodorant. A bleaching action is maintained in the liquid so as to have a decolorizing effect. The liquid is recycled and reused. The solid particle is reduced and the high solid content portion is stored until all the solid has been chemically broken down by the liquid. (Merritt-FIRL)
W76-02861

WASTE WATER PURIFICATION.
Belgian Patent 801,541, Applied June 27, 1973, Issued December 27, 1973. Derwent Belgian Patents Reports, Vol 5, No 3, p 4, February 21, 1974.

Descriptors: *Water purification, *Waste water treatment, *Activated carbon, Suspended solids, Organic matter, Municipal wastes, Industrial wastes, Adsorption, Oxygen, Growth rates, Control, *Patents.

A method of waste water purification using active carbon with aerobic growth control by oxygen treatment is described. Suspended and dissolved organic impurities are removed from sanitary municipal or industrial waste water, including petroleum refinery effluents, by passing the water preferably upward through one active carbon bed. The bed is treated with 0.040-0.07 kg oxygen for each 0.45 kg oxygen consumed by chemical oxygen requirement-impurities removed from waste water. The active carbon bed is preferably rinsed periodically by passing water upward at a sufficiently high rate to diminish biological growth collection on active carbon. In a preferred process, 0.02-0.5 kg oxygen are supplied for each 0.45 kg oxygen consumed by chemical oxygen requirement impurities removed from waste water. During rinsing the active carbon is treated at intervals with an oxygen containing gas stream. (Merritt-FIRL)
W76-02862

WASTE-WATER PURIFICATION.
French Patent 7,301,794, Applied March 14, 1973, Issued November 7, 1973. French Patents Abstracts, Vol 5, No 2, p 2, February 14, 1974.

Descriptors: Water purification, *Organic matter, *Oxidation, Reduction, Nitrogen, Adsorption, Sludge, *Biological treatment, *Aerobic conditions, Organic compounds, *Waste water treatment, *Patents.

The purification of waste waters by simultaneous removal of organic carbonaceous material and biological oxidation of the reduced nitrogenous forms in waste waters followed by subsequent reduction of the oxidized nitrogen to elemental nitrogen is described. An aqueous suspension of a suitable adsorbent is added to a vessel containing waste water and a developing active biomass having a sludge age of > and = 3 days. Aerobic conditions are maintained to oxidize the ammoniacal nitrogen to nitrite or nitrate nitrogen. The adsorbent, associated adsorbed organic material, and biological solids are separated, and the solids are returned to the vessel. The liquid phase goes into an anaerobic zone to which further adsorbent and a source of organic carbon is added. The oxidized

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itrogen forms are reduced to elemental nitrogen nd the mixture goes to a quiescent zone where the dsorbent and associated organic material are emoved from the waste water. (Merritt-FIRL)
W76-02863

N ECONOMIC EVALUATION OF ALTERNA-IVE SEWERAGE PRICING AND INVEST-IENT PRACTICES: THE MADISON IETROPOLITAN SEWERAGE DISTRICT,
Visconsin Univ., Madison. Dept. of Agricultural conomics.
or primary bibliographic entry see Field 5G.
W76-02864

YNAMICS OF HAZARDOUS ELEMENTS IN ASTEWATER PONDS,
Michigan State Univ., East Lansing. Dept. of isheries and Wildlife.
. B. Lisiecki, and C. D. McNabb.
vailable from the National Technical Informa-ion Service, Springfield, Va 22161 as PB-248 404, 5.50 in paper copy, $2.25 in microfiche. Comple-ion Report, Institute of Water Research, Michigan State University, East Lansing, December, 1975). 90 p, 4 fig, 39 tab, 32 ref, ap-end. OWRT A-073-MICH(1). 14-31-0001-4022.

escriptors: *Michigan, *Oxidation lagoons, aste water treatment, *Vascular plants, Tem-erature, Light, Dissolved oxygen, Copper, Cad-nium, Plant populations, Germination, Zooplank-on, Invertebrates, Michigan, Sediments, ydrogen ion concentration, Oxidation-reduction otential.
dentifiers: Metal budgets, Water quality manage-ent project, Lemma minor L., Waste stabiliza-ion ponds, Ceratophyllum demersum L., otamogeton foliosus Raf.

detailed record was developed of temperature, ght, dissolved oxygen, Eh, pH, and sediment haracteristics for a municipal waste stabilization ond in Michigan in which the dynamics of copper nd cadmium were studied over the growing eason. The submersed vascular plants, eratophyllum demersum L. and Potomogeton oliosus Ref., and the epineustic Lemma minor L. ormed the principal plant population in the pond. heir degree of participation in the budgets of the etals is described. Budgets for total copper and otal cadmium were developed for the pond at two r three week intervals from May through Sep-ember. For the period of study, the plants had a et loss equivalent to 2% of the copper influent to he pond. There was a net removal of cadmium by he pond for intervals from the start of the study to id-August. The aquatic plant community showed net gain in cadmium until mid-August, and a net ss with senescence thereafter. The zooplankton nd benthic macroinvertebrates of the pond howed net gains and losses that were a very small raction of the total budgets of the elements. Less an 5% of the quantity of either element influent fter the initiation of growth in spring could have een removed by a harvest of the aquatic plants at would have been timed for maximum emoval.
W76-02867

HYSICOCHEMICAL APPROACH TO WATER ND WASTEWATER FILTRATION,
Maine Univ., Orono. Dept. of Civil Engineering.
I. M. Ghosh, T. A. Jordan, and R. L. Porter.
ournal of the Environmental Engineering Divi-on, Proceedings of ASCE, Vol 101, No EE1, p 1-86, February, 1975. 6 fig, 4 tab, 19 ref, 2 ap-end. OWRT A-023-ME(1).

escriptors: *Waste water treatment, *Filtration, Mathematical models, Model studies, Filters, esign criteria, Optimization.
dentifiers: *Physico-chemical treatment, Granu-r filters, Sand filters.

The prerequisite to the optimization of granual filter design is a reliable mathematical description of the capture of suspended particles by packed collector grains within a flow. A conceptual model is presented which has been developed for the depth filtration of water and waste water using packed beds. The removal of small particles through uniform sand beds under low speed flows based on the concentration boundary layer theory of diffusional deposition of particles is described. The model is an extension of that proposed by Spielman and Fitzpatrick and includes the effects of gravity, interception, hydrodynamic forces, London attraction, and Brownian diffusion for systems with negligible double layer repulsion. The ultimate capture of a particle in a packed bed is determined by the transport mechanisms and also by the short-range surface forces which are shown to have a dominant role in the particle's attachment to media grains. Experimental results obtained for the filtration of secondary effluent using a polymer-coated sand bed agreed with the predictive model for systems where the effluent was preconditioned using polymeric aids to reduce the double layer forces to a minimum. Jar tests or electrophoretic mobility measurements can be used to determine the optimum dosage of a destabilizing chemical. It was concluded that with proper control, sand filters may be used for the effective removal of very small particles of 0.1 micrometer or less such as viruses and other biocolloids and colloidal inorganic solids. (Orr-FIRL)
W76-02873

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. C. Yen, and A. S. Sevuk.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE4, p 535-553, August, 1975. 4 fig, 5 tab, 15 ref. OWRT B-043-ILL(10) and C-4123(9023)(3).

Descriptors: *Design criteria, *Model studies, *Sewerage, Storm runoff, Water resources development, Water management(Applied), Combined sewers, Networks, Mathematical models, Storm drains, *Drainage, Urbanization.
Identifiers: *Steady-flow routing model, *Chicago models, *Kinematic wave models, Flow models, Storm water management model, Illinois Storm Sewer System Simulation Model, British road research laboratory method.

Design methods for sizing the pipes of storm or combined sewer systems are evaluated and compared. Such methods include: the steady-flow routing method that is usually used for sewer mains in conjunction with the rational method; the Chicago method; the EPA Storm Water Management Model (SWMM); the Illinois Storm Water Sewer Simulation Model (ISS) model; and a simplified transient flow model called the kinematic wave model. It is assumed that layout of the sewer network is previously determined, and only hydraulic aspects of sewer design are considered. From this study it was concluded that the steady-flow routing method is relatively the simplest, does not require computer, and can be used for small networks or when high accuracy is not necessary. Of two versions of this method, one which uses time shifting of hydrographs is recommended. No improvement in design of sewers was found using the Chicago or the British Road Research Laboratory (RRL) methods, and they were more complicated than the time-shifting version of the steady-flow method. The ISS Model is the most accurate method of sewer design and is recommended when high accuracy is required and for design of large sewer systems. This model can also be used to evaluate the effect of retention storage in a sewer system on storm runoff. However, the ISS model requires the use of digital computers. The SWMM and the kinetic-wave models should be used for a performance quality rated between the ISS and steady-flow routing models; they provide moderate accuracy and may be applied to large sewer networks. (Kramer-FIRL)
W76-02875

MINIMIZATION OF COMBINED SEWER OVERFLOWS BY LARGE-SCALE MATHEMATICAL PROGRAMMING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
J. W. Labadie, N. S. Grigg, and P. D. Trotta.
Computers and Operations Research, Vol 1, Nos 3/4, p 421-435, December 1974. 6 fig, 1 tab, 34 equ, 14 ref.

Descriptors: *Combined sewers, *Overflow, *Water pollution control, Operations research, Storage, Storm water, Algorithms, Optimization, Constraints, Simulation analysis, Dynamic programming, Mathematical models, Systems analysis, *Computer programs.
Identifiers: *Automatic control, Orthogonal polynomials, Separability, Minimization, Receiving waters, Urban overflows, System decomposition, *Flow-projection technique, Quadratic programming.

There is a critical need for control strategies for minimizing receiving water pollution caused by overflows from combined sewer systems. As a viable approach to this problem, control is carried out through regulation of ambient and/or auxiliary storage in the system. The goal is to detain storm flows in the system long enough to prevent flows of a magnitude that exceeds treatment plant capacity, thereby reducing overflow into receiving waters. The problem is first attacked by dividing the large combined sewer system into several mildly interconnected subsystems for which control logic can be developed from application of mathematical programming algorithms consistent with the special characteristics of each subsystem. A flow-projection technique is developed for subsystems not amenable to direct solution by standard optimization methods. In comparison with other techniques, the flow projection method has the advantage of greater flexibility in that any flow routing technique can be supplied as a subroutine in the computer program, without requiring restructuring the rest of the program. Initial computation results indicate that convergence characteristics are satisfactory. More experience is needed for a wide range of flow routing models and subbasin reserovir configurations. The eventual goal is a generalized computer code for considering any model and configuration associated with any subbasin. (Bell-Cornell)
W76-02878

CHANGE OF SOME PHYSIOLOGICAL AND BIOCHEMICAL INDICES OF PHRAGMITES COMMUNIS TRIN. WITH DIFFERENT MINERAL NUTRITION UNDER EXPERIMENTAL CONDITIONS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-02942

DEMONSTRATION OF A METHODOLOGY FOR DREDGED MATERIAL RECLAMATION AND DRAINAGE,
Dames and Moore, San Francisco, Calif.
For primary bibliographic entry see Field 5E.
W76-02945

HOW ABITIBI INSULATION BOARD MILL ACHIEVES ZERO EFFLUENT DISCHARGE.
For primary bibliographic entry see Field 3E.
W76-02947

SEDIMENTATION-FLOTATION (SEDIMENTATION-FLOTATION),
A. Bolling.

Der Papiermacher, Vol 25, No 8, p 122-123, August 2, 1975.

Descriptors: *Pulp wastes, *Sedimentation, *Flotation, Pulp and paper industry, Equipment, Design, Waste water treatment, Waste treatment.
Identifiers: *Savealls, Fiber recovery, White water.

The design principles of sedimentation, flotation, and combined sedimentation/flotation savealls used in the paper industry are outlined. (Speckhard-IPC)
W76-02948

TREATMENT OF ELECTROPLATING WASTE WATERS BY A FLOTATION TECHNIQUE,
Trent Polytechnic, Nottingham (England). Dept. of Physical Sciences.
G. E. P. Elliott, and M. J. Hanbury.
Effluent and Water Treatment Journal, Vol 15, No. 9, p 475, 478-481, September, 1975. 6 fig, 9 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Heavy metlas, *Foam fractionation, *Froth flotation, Flotation.
Identifiers: Electroplating wastes.

An experimental study is described which tested foam fractionation and froth flotation treatment of electroplating waste waters containing nickel. Cetyltrimethyl ammonium bromide (CTAB), a polyethylene oxide (Nonidet P40), and sodium dodecyl benzene sulfonate (Na-DBS) were tested as collectors and frothing agents. The simulated waste waters contained nickel sulfate, sodium chloride, hydrochloric acid, sodium hydroxide, collector, and commercial additives such as hardeners and brighteners. The process was also tested with actual electroplating swill waters. The extraction of nickel hydroxide from electroplating swill waters by precipitate flotation using Na-DBS as collector and frother is rapid and nearly complete. The presence of borate ions (a constituent of some plating additives) inhibits this extraction, but seriously only at a level of 0.30 mol/liter. The results of this study form a basis for the implementation of full-scale treatment of effluents from metal plating plants. (Orr-FIRL)
W76-02973

COMPACT INDUSTRIAL EFFLUENT FLOTATION APPTS.
French Patent FR 2248-086. Issued June 20, 1975.
French Patents Abstracts, Vol. W, No 30, p D3, September 2, 1975.

Descriptors: *Waste water treatment, *Flotation, *Industrial wastes, Equipment, *Patents, Pulp and paper industry, Suspended solids, Flocculation, Coagulation, Chemical reactions, Separation techniques, Recycling, Colloids.

A flotation apparatus and process designed for the separation of suspended soilds (SS) and/or colloidal particles from industrial waste water, such as papermill effluents, has been patented. The main body of the equipment is a longitudinal reservoir with a feed for the effluent at one end and a purified water overflow at the other end. A mixture of floculating and coagulating agents is fed into the reservoir. The base of the reservoir slopes to produce an upward flow of the effluent to be treated and the reagents. Prior to being fed into the reservoir, the waste water is saturated with air. Flocculation of the colloids begins as soon as the effluent and reagents are mixed; the flocculated colloids are entrained in a battery of rapid lamellar separation cells. The SS float to the surface of the reservoir and are removed by scrapers. The separated matter is segregated so that the two types of particles can be collected at two different points in the system. The collected particles are then recycled into the manufacturing process. (Orr-FIRL)
W76-02974

SEPARATION OF ESP. OIL IN WATER EMULSIONS.
French Patent FR 2248-068. Issued June 20, 1975.
French Patents Abstracts, Vol W, No. 30, p J1, September 2, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Emulsions, Oily water, Separation techniques, Equipment, *Patents.

An oil/water separator has been granted a patent. The equipment consists of sections of coalescing media compressed together in a housing, and sorbing media. The sorbing medium is formed from microfibers of polymers based on ethylene, propylene, or styrene; the coalescing medium is glass fibers. Contaminated liquid flows along substantially continuous, thin, low pressure drop paths in the coalescing medium. The dispersed phase is sorbed by the sorbing medium at the interfaces. The sorbing medium is preferentially wetted by the dispersed phase. (Orr-FIRL)
W76-02975

RECOVERY OF SOLVENTS FOR THE PAINT AND ALLIED INDUSTRIES,
F. A. Howard.
Paint Manufacture, Vol. 45, No. 7, p 22-23, September, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Paints, Recycling, Solvents, Costs.

Recent shortages and price increases of solvents have made paint manufacturers and users aware of the need for solvent recycling. Solvents that can be recovered in the paint industry include those used in: cleaning surfaces before painting; leaning paint application equipment; cleaning paint mills at the manufacturing stage; and paint stripping. The first step in instituting a recovery process is to identify the recoverable wastes produced in a factory then set up a collection and storage system. Waste streams should be segregated to allow recovery to be performed most efficiently and economically. Surface pre-cleaning solvents typically contain water, dirt, oil and grease. These solvents can be processed to meet original specifications provided that contamination with other solvents is avoided. Solvents used in cleaning paint application and manufacturing equipment are normally recovered as mixtures for reuse in cleaning applications, however, they can also be recovered to specifications permitting reuse in formulation. Solvents used for industrial paint stripping are usually mixtures based on methylene chloride and are not normally recovered. Recovery of these solvents might be feasible if a large solids build-up is prevented. Waste paints should be disposed of in an acceptable manner; some of the paint may be recycled to other colors or applications. The minimum amount of recoverable solvent that is normally processed is 500 gal. If the solvent is low priced, then a minimum lot size would be 2000 gal. Services are available in Great Britain from the Chemical Recovery Association for recovering bulk and drum material. Cost depends on the type of solvent, contamination level, and ease of recovery; it is normally between 0.15 and 0.30 pounds/gal. (Orr-FIRL)
W76-02976

ANAEROBIC TREATMENT OF INDUSTRIAL WASTES,
G. W. Scammell.
Process Biochemistry, Vol. 10, No. 8, p 34-36, October, 1975. 5 fig, 13 ref.

Descriptors: *Waste water treatment, *Anaerobic digestion, *Anaerobic conditions, *Industrial wastes, Methane, Carbon dioxide, Odor, Sludge, Biochemical oxygen demand, Chemical oxygen demand, Kinetics.
Identifiers: Solids retention time.

In the anaerobic digestion process, over 80% of the BOD is removed in the gaseous form as a mixture of methane and carbon dioxide. Thus, 85% of the energy of degradation is preserved as a gas that can be used in gas engine generators, or heating equipment. The anaerobic process produces only 10-20% of the sludge produced by a high-rate aerobic process and less than half of that produced by an extended aeration plant. The sludge is also more stable and less odorous than aerobically produced sludge. Anaerobic digestion can be considered as occurring in two stages: hydrolysis and breakdown of complex materials to simple fatty acids, plus hydrogen carbon dioxide, ammonia, and salts; and, production of methane and additional carbon dioxide from the fatty acids and hydrogen. The kinetics of anaerobic digestion can be considered to be those of the rate-limiting stage (the second stage). The rate of COD reduction is related to the growth of bacteria by a Monod type relationship. The kinetics functions presented provide a working basis for the process. In the contact anaerobic process, the solids retention time (SRT) can be varied independent of the hydraulic retention time (HRT), producing a more compact process. With good process control, anaerobic treatment has considerable economic advantages over aerobic processes. (Orr-FIRL)
W76-02977

WASTE LIQUID TREATMENT METHOD BY THE ROTATING DISK CONTACT OXIDATION METHOD (KAITEN DESUKU NO SESSHOKU NI YORU HAISUI SHORIHO),
N. Nakamura.
Kemikaru Enjiniaringu, Chemical Engineering, Vol. 18, No. 8, p 44-49, August, 1973. 3 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Pre-treatment, Food processing industry, Filtration, Oxidation, Biological treatment, Microorganisms.
Identifiers: Rotating disk, Contact oxidation, Bean paste manufacturing wastes.

Liquid wastes from the manufacture of bean paste have been treated using the rotating disk-contact oxidation method. Preliminary treatment was carried out by filtering the liquid waste with a 60-mesh sieve and removing the volatile acids with a skimmer. The resultant water was fed to a storage tank to which excess sludge from the sedimentation basin of the rotating disk was added. The water was then passed through the contact oxidation basin to the sedimentation basin from which sludge was removed to the oxidation basin. Contact oxidation by the biological film of the rotary disk depends largely on the living environment of the microorganisms. (Seigle-FIRL)
W76-02978

TREATMENT OF GLASS MANUFACTURING LIQUID WASTE (GARASU KAKO HAIEKI NO SHORI),
T. Kobayashi.
Kogaku Gijutsu Kontakuto, Optical Technology Contact, Vol. 11, No. 5, p 24-28, May, 1973. 6 fig, 4 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, Lead, Cadmium, Zinc, Arsenic, Neutralization, Polymers, Coagulation, Separation techniques, Hydrogen ion concentration.
Identifiers: Optical glass manufacturing wastes.

Liquid waste from optical glass manufacturing contains large quantities of heavy metals such as lead, cadmium, zinc, chromium, arsenic, and thorium. Metals other than cadmium can be easily removed as hydroxides in alkali solution. For the complete treatment of the liquid waste, a sequence of seven steps is required. These include: the addition of 50 ppm tin salts; the addition of 100 ppm iron salts; adjustment of the pH to 12 by caustic soda; adjustment of the pH again to 10 with PAC;

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he addition of 200 ppm polymer coagulant; the eparation of solids from liquid; and, the final adustment of the pH. By this method, the cadmium ontent in the liquid waste can be reduced from as igh as 0.18 ppm to 0.01 ppm. (Seigle-FIRL)
W76-02979

OXYGEN BLEACHING-A MILL PROVEN SOLUTION TO POLLUTION ABATEMENT SANSO, ARUKARI HYOHAKU NI YORU HAISUI NO OSEN BOSHI),
S. Mizuguchi.
Kamipa Gikyo-shi, (Journal of the Japanese Technical Association of Pulp and Paper Indusry), Vol. 27, No. 8, p 3-14, August, 1973. 16 fig, 3 ab.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Water pollution abatement, Screens, Filtration, Biochemical oxygen demand, Color.
Identifiers: Oxygen bleaching.

The oxygen bleaching process developed at the Husum factory in Sweden has proven successful in producing fine quality pulp with few pollution problems. The apparatus consists of four batch digesters controlled by computer to minimize the deterioration of untreated pulp, a batch diffuser for washing both black solution and clean water, a screen which transfers waste to a cyclone cleaner, a filter-I regulator for supplying adequate concentrations of pulp for the next pressing, a press, an oxygen column, and a filter-II in which clean water is circulated for final washing. Results indicate that the BOD of the waste water is reduced 40 to 50 percent and color, more than 70 percent. (Seigle-FIRL)
W76-02980

STUDIES ON INDUSTRIAL WASTEWATER TREATMENT IN CLOSED SYSTEM-PART 1, RECOVERY OF RAW-MATERIAL, LACTAM MONOMER FROM NYLON (6) PROCESSING WASTE,
Osaka Univ. (Japan). Dept. of Technology.
I. Tajiri, and I. Matsui.
Nenryo Kyokai-shi, (Journal of Fuel Society of Japan), Vol 52, No 555, p 609-617, July, 1973. 8 fig, 10 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Laboratory tests, Pilot plants, Activated carbon, Recycling.
Identifiers: Nylon manufacturing, Lactam, Acetone, Steam treatment.

Experiments have been conducted both in the laboratory and at pilot plants to study the recovery of lactam from the waste water of nylon manufacturing. In this method, 10 to 30 grams to activated carbon are added to a water solution containing 1.78% lactam and the mixture is stirred for one hour. Measurements of the lactam concentration in the residual solutions showed that between 1.8 and 2.74% was recovered. At a pilot plant, 140 grams of activated carbon were column-packed and a high concentration waste water containing 1500-2000 mg/liter of lactam was passed through at 15C and a rate of 0.45 cu m/hour for 20 hours. Approximately 90% of the lactam was recovered by acetone and super-heated steam treatment. (Seigle-FIRL)
W76-02981

INDUSTRIAL WASTE LIQUID TREATMENT BY NEW COALESCERS (SHINHOSHUZAI NI YORU SANGYO HAISUI SHORI GIJUTSU).
Sangyo to Kankyo (Industry and Environment), Vol 2, No 8, p 64-70, August, 1973. 8 fig, 3 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, Coalescence, Foaming, Copper, Hydrogen ion concentration, Chemical reactions.
Identifiers: Chemical treatment.

N-alkylethylenediamines and N-alkyldiethylenetriamine were prepared from C12 to C18 alkyl halides and ethylenediamine or ethylenetriamine as new coalescers for the removal of metals in waste water. The new reagents have the following characteristics: solubilily in water; capabilily of foaming in water when combined with metals; and applicability over a wide range of pH. In testing, a given quantity of the reagent was added to water containing metal ions and air or nitrogen gas then was passed through the liquid at a flow rate of 300 ml/min for approximately 12 minutes. The formation of foam required 10 to 12 minutes depending on the quantity of the reagent used. Results showed that N-dodecylethylenediamine was the most effective reagent among the alkylethylenediamines for removing copper ions at a pH value about 6, while the optimum pH value for N-alkyldiethylenetriamine ranged from 6 to 10. Also, it was found that 2 to 3 equivalents of the reagent were necessary for best results. (Seigle-FIRL)
W76-02982

APPLICATION OF BACTERIA FOR A NEW TREATMENT METHOD OF FACTORY LIQUID WASTE (SHIN-BISEIBUTSU NI YORU KOJO HAISUI SHORI E NO OYO),
S. Kojima.
PPM, Vol 4, No 8, p 43-49, August, 1973. 8 fig, 4 tab, 3 ref.

Descriptors: *Filtration, *Biological treatment, *Membrane processes, *Chemical wastes, *Waste water treatment, Liquid wastes, Biochemical oxygen demand, Ammonia.

From experimentation, repeated horizontal filtering of polluted water through an open layer of sand was found effective for purifying water because of the constant supply of oxygen. In order to create biological membranes to repeat filtering and to make purification more effective, the tube contact oxidation system was devised as a compact biological treatment system for factory liquid wastes. In this system, three layers of concentric cylinders form a tank, with pipe leading air and polluted water into the center cylinder. Honeycomb tubes are packed between the cylinders. After the water is forced through the cylinder the filtered water flows out of the tank through a wider brim and is airlifted by a compressor. The water rises, overflows, filters back through the honeycomb tubes, and is again airlifted. Biological membranes grow on the surface of the walls and water purification becomes more effective. In summer, the rate of elimination of ammonia is 100% in two hours and the rate for BOD is 91% in two hours. (Seigle-FIRL)
W76-02983

TREATMENT METHOD FOR LIQUID WASTE CONTAINING SURFACE ACTIVATORS (KAIMEN KASSEIZAI O GANYU SURU HAISUI NO SHORIHO),
K. Hagiwara, and Y. Murakami.
Mizu Shori Gijutsu, (Water Purification Liquid Waste Treatment), Vol 14, No 6, p 581-585, June, 1973. 8 fig, 3 tab, 5 ref.

Descriptors: *Waste water treatment, *Surfactants, *Liquid wastes, Effluents, Chemical industry, Chemical wastes, Pre-treatment, Oil.

A treatment method for liquid waste containing surfactants, especially non-ionic surfactants, has been devised. The effects of the method are checked by measurement of the TOC in effluents before and after treatment. In this method, various condensed chemicals are added to a solution containing surfactants (200 ppm); iron sulfite is added until a 20 ppm FeS concentration is reached; pH is adjusted (best at 5); and the liquid left to settle. Later, the liquid is filtered and residual TOC measured. With the use of 100 ppm condensers, TOC can be decreased to 5-30 ppm when surfactants are not negatively ionized. In treating effluents, this method should be combined with a liquid waste treatment system; however, this method is quite effective as a pretreatment step for eliminating surfactants and oil. (Seigle-FIRL)
W76-02984

NEW MAGNET POLLUTION REMOVAL METHOD BARED.
The Japan Times Weekly, p 11, July 7, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, Cadmium, Water pollution control, Magnetic studies.
Identifiers: Ferrous sulfate, Magnetism, Chromium.

A simple method to remove cadmium, hexachromium, and other poisonous heavy metals from industrial waste water is a potentially effective method for combatting pollution. The method, based on the ferromagnetic 'super-neferrite' production process, involves the use of magnetism and ferrous sulfate. This magnetic treatment method is the first successful method to remove heavy metals almost completely. The process can reduce 1800 ppm of cadmium to below 0.1 ppm and 2000 ppm hexachromium to below 0.1 ppm. The advantages include: large amounts of waste water containing many types of heavy metals can be treated; and, ferrous sulfate, a waste produced in large quantities by steel mills, can be used. Ferrite collected from the waste water can be used as magnets. (Sandoski-FIRL)
W76-02986

THE COWS VS. THE SUBURBS,
Washington State Univ., Pullman. Coll. of Engineering.
D. C. Flaherty.
Quest, Vol 6, No 1, p 1-7, March, 1968. 10 fig.

Descriptors: *Dairy industry, Costs, Research and Development, Water pollution, Social aspects, Lagoons, Grants.
Identifiers: Land spreading.

The problem of cow-suburb co-existence, although common in many parts of the United States, is becoming especially acute in certain areas of western Washington. Not only is there as aesthetic problem, but even more critical is the potential water pollution problem. To prove the belief that cows and suburbs can exist together, an extensive research project was begun last May with Dr. Donald E. Proctor, a Research Division sanitary engineer, as the chief investigator. The study is primarily being carried out at the Monroe Reformatory Honor Dairy Farm. Because of flooding problems, Dr. Proctor asked for a Solid Waste Disposal Demonstration Grant. It is anticipated that after the end of the three-year study, the Monroe project facilities will remain in operation. The project facilities will continue to be available for inspection by anyone interested in dairy management. Also, all operating data and evaluation reports will be available for study by interested individuals or agencies. (Cameron-East Central Oklahoma State)
W76-02990

REDUCTION OF TOXICITY OF AQUEOUS SOLUTIONS,
K. Enns, J. J. Byerley, and C. J. Beingessner.
U.S. Patents No 3,900,377, 7 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 937, No 3, p 946, August 19, 1975.

Descriptors: *Patents, *Industrial wastes, *Chemical wastes, *Wastes water treatment, *Electrochemistry, Electrodes, Oxidation, Anodes.
Identifiers: *Cyanides.

The electrochemical process of the invention reapidly reduces the toxicity of cyanide containing aqueous solutions and converts the cyanide ions to relatively harmless by-products. The process involves the electrochemical oxidation of cyanide ions at anodic surfaces. The process is carried out using a large electrode surface area. The large surface area may be provided in a single reactor, or in a number of reactors operating in series or in parallel. The cell preferably utilizes a number of sheet-like electrodes. Adjacent electrodes are closely-spaced apart and each facing pair defines a liquid flow channel. Liquid communication is provided between successive flow channels to provide a liquid flow path through the cell in which the liquid passes successively across the faces of each pair of adjacent electrodes. Typically, the electrodes are flat sheets positioned in parallel horizontal planes with openings being provided through each sheet. The openings are provided in this typical construction at opposite peripheries of each successive sheet electrode. By utilizing a large surface area of electrode in the cell it is possible to operate the cell at a high current while maintaining an overall low current density. (Sinha-OEIS)
W76-02992

5E. Ultimate Disposal Of Wastes

UTILIZATION OF ALL WASTES (VSE OTKHODY -- V DELO),
Khorskii Gidroliznyi Zavod (USSR).
N. F. Kazakova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 3, p 26, 1975. 1 tab, 1 ref.

Descriptors: *Activated sludge, *Yeasts, *Foods, *Feeds, Sludge, Water pollution sources, Wastes, Industrial wastes, Water pollution control, Sludge disposal, Proteins, Moisture content, Solid wastes, Byproducts, Ultimate disposal.

The use of activated sludge from secondary sedimentation tanks as a yeast additive at the Khorsk hydrolysis plant has been reported earlier (cf. Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 6, p 29, 1974). In this brief report, data are given on the consumption of the activated sludge for this purpose and the composition of yeast (moisture, ash, and protein contents) grown with and without the additive. (Stapinski-IPC)
W76-02509

BIOMASS -- A PRODUCT OF BIOLOGICAL PURIFICATION OF PULPING EFFLUENTS AS FEED FOR POULTRY (BIOMASA -- PRODUKT BIOLOGICKEHO CISTENI ODPADNICH VOD PO VYROBE CELULOZY -- JAKO KRMIVO PRO DRUBEZ),
Research Inst. of Veterinary Medicine, Brno (Czechoslovakia).
L. Najman, M. Toulova, R. +)Jilek, and H. Prochazka.
Biologizace a Chemizace Vyzivy Zvirat, Vol 9, No 4, p 367-374, 1973. 1 fig, 11 ref, 6 tab. English summary.

Descriptors: *Pulp wastes, *Sulfite liquors, *Poultry, *Biomass, *Feeds, Wastes, Industrial wastes, Water pollution sources, Waste water treatment, Biological treatment, Diets, Foods, Nitrogen compounds, Amino acids, Fibers(Plant), Cellulose, Growth rates, Fungi, Proteins, Ultimate disposal, Byproducts.
Identifiers: Arginine, Mycelium sterilium, Spent sulfite liquor, Spent pulping liquors.

Results are reported of experiments in which 7-day-old chickens were fed for 3 weeks a standard diet containing 18% nitrogenous substances (dried milk and soybean extract) and a diet in which up to 20% proteins were replaced by dried biomass of the fungus Mycelium sterilium grown in a spent sulfite liquor medium. An analysis of this material showed that, compared with Torula yeast, brewer's yeast, and yeast grown in spent sulfite liquor, it contains less nitrogenous compounds, less arginine, more sulfur-containing amino acids, and more fiber and ash. The growth rate of chickens fed a diet in which 3 and 5% standard proteins were replaced by the fungal biomass, was higher than on the standard diet. At 10% biomass, the growth rate decreased, and at 20% was lower than on the standard diet. No changes were observed in the activity of amino-transferase, but the blood serum protein level tended to decrease at higher doses of the biomass. The dry weight of the meat remained unchanged, and its taste was improved. (Stapinski-IPC)
W76-02515

FOR A MORE COMPLETE UTILIZATION OF SULFITE AND SULFATE SPENT LIQUORS AND PREHYDROLYZATES (POLNEE ISPOL'ZOVAT' SUL'FITNYE, SUL'FATNYE SHCHELOKA I PREDGIDROLIZATY),
Gosudarstvennaya Planovaya Komissiya, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W76-02516

SPRAY-IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT AND ITS EFFECT ON CHEMICAL PROPERTIES OF FOREST SOILS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. L. Richenderfer, W. E. Sopper, and L. T. Kardos.
U.S. Department of Agriculture, Forest Service, General Technical Report NE-17, 1975. 24 p, 17 fig, 10 ref, 18 tab.

Descriptors: *Municipal wastes, *Irrigation effects, *Soil disposal fields, *Forest soils, Sprinkler irrigation, Spraying, Waste water disposal, Soil properties, Potassium, Calcium, Manganese, Magnesium, Sodiu, Hydrogen, Boron, Phosphorus, Hydrogen ion concentration, Nitrogen, Organic matter, Waste disposal, Chemical properties, Soils.

Several forested areas on two soil types in Pennsylvania were irrigated with treated municipal sewage effluent for 9 years (1963-1971). Soil samples were collected to a depth of 5 ft in 1963, 1967and 1971 and analyzed for potassium, calcium, magnesium, sodium, exchangeable hydrogen, manganese, boron, phosphorus, pH, total nitrogen, and organic matter. Of the 11 constituents analyzed, only potassium, sodium, manganese, exchangeable hydrogen, boron, and phosphorus showed significant changes in concentration over time. Potassium, manganese, exchangeable hydrogen, and boron decreased significantly over time while sodium and phosphorus increased. Indications are that the treatment had no detrimental effects on the soil. (Witt-IPC)
W76-02521

HEAT DISPOSAL IN WATER ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W76-02559

EFFLUENT YIELDS GYPSUM AND PURE WATER AT CYANAMID'S T102 PLANT,
For primary bibliographic entry see Field 5D.
W76-02586

OXFORDSHIRE WASTE SURVEY INTERIM RESULTS.
Process Engineering, p 5, September, 1975. 1 fig.

Descriptors: *Waste water treatment, *Waste water disposal, *Liquid wastes, *Industrial wastes, Surveys, Heavy metals, Recycling, Waste disposal.
Identifiers: Great Britain.

A survey of industrial waste disposal was conducted on the Oxfordshire area of Great Britain. The Oxfordshire area was chosen because it is served by one Waste Disposal Authority, and it encompasses a wide range of industries and company size, including small firms which would not be able to invest in a treatment plant. The pattern of waste disposal found is illustrated. Preliminary survey results identified the following areas for further study: reclamation of oil in an emulsion with more than 25 percent water; use for currently scrapped offcuts of man-made materials, non-wovens and composites such as textile/plastic/adhesive mixtures; recycling of mixed polymers; recovery of heavily inked or oiled paper; and, reuse of solvents from paint shops. A central reclamation area for waste containing heavy metals is suggested as a means to recover the tons of metals that are lost each year in dilute solutions in different areas of the country. The final results of the survey will determine how big such a site should be, how the site should be run, and what the products should cost. (Orr-FIRL)
W76-02589

LIQUID WASTE INCINERATION BY BALFOUR/NITTETU SYSTEM SOLVES EFFLUENT PROBLEMS, CAN PAY FOR ITSELF OR EVEN TURN WASTE INTO PROFIT.
The Chemical Engineer, No 229/300, p 432, July/August, 1975. 2 fig, 1 photo.

Descriptors: *Waste water treatment, *Waste water disposal, *Liquid wastes, *Industrial wastes, *Incineration, Equipment, Recycling, Inorganic compounds, Organic compounds.

Henry Balfour and Company Limited, Leven, Scotland, is the United Kingdom dealer for the liquid waste incineration and salt recovery system of Nittetu Chemical Engineering Limited of Tokyo, Japan. Waste liquid is sprayed into the incinerator through fluid atomizers. The incinerator consists of a steel shell with high alumina refractory lining with an operating temperature of 800-1100 C maintained by a vertical down firing high energy release burner fired by natural gas, fuel oil or distillation residues. A wide range of standard sizes is available from 0.5 m kcal/hr to 15.0 m kcal/hr. When high COD liquid wastes containing organic/inorganic mixtures or inorganic salts alone are incinerated, inorganic salts can be recovered for reuse or sale. If the inorganic salt solution recovered cannot be reused, the solution can be discharged with a COD level below 20 ppm. Energy savings are realized by using the heat in the combustion gases for preevaporation of the waste before incineration. If it is desirable to recover the inorganic components as a solid, the quench vessel liquor can be treated in a suitable crystallization, filtration, and drying system. A pilot plant has been installed at the Research and Development Center of Henry Balfour and Company Limited. The pilot plant incinerator has total combustion capacity of 0.3 m kcal/hr and can handle up to 120 liters/hr of waste liquid. (Orr-FIRL)
W76-02591

HARGREAVES CLEARWASTE TREATMENT CENTRE, WAKEFIELD.
For primary bibliographic entry see Field 5D.
W76-02592

HEAT TREATMENT OF WASTE SLUDGES,
Chicago Bridge and Iron Co., Oak Brook, Ill. (Assignee).
For primary bibliographic entry see Field 5D.
W76-02597

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SE OF DOMESTIC WASTE GLASS FOR RBAN PAVING, SUMMARY REPORT,
lissouri Univ., Rolla. Dept. of Civil Engineering.
/. R. Malisch, D. E. Day, and B. G. Wixson.
vailable from the National Technical Informaon Service, Springfield, Va 22161. Environmenl Protection Agency, Report EPA-670/2-75-053, lay 1975. 46 p, 23 tab, 25 ref. 1DB314, ROAP-4AIN, Task 19. EP-00329.

escriptors: *Glass, *Asphalts, *Aggregates, ieve analysis, *Recycling, Cities, *Asphaltic oncrete, Income, Paving, Solid wastes, Lime.
dentifiers: *Resource recovery, Marshall design; lydrated lime, *Glass-asphalt aggregate, Cullet.

summary is presented of research on the use of aste glass as an aggregate in asphaltic paving ixtures. Reusing waste glass in this manner ould provide an outlet for large quantities of the lass and would permit recycling in urban areas here large accumulations of glass are found. ield tests as well as observations of pavement erformance have indicated that field installations f asphaltic paving mixtures containing glass have enerally maintained adequate skid resistance and erformed acceptably from a structural standoint. The economic feasibility of using waste lass as an aggregate in asphaltic concrete depends rimarily on developing resource recovery ystems that can separate glass along with other ecyclable components and generate enough evenues from their sale, plus disposal and rocessing fees, to produce an acceptable return n equity. (EPA)
/76-02657

EVIEW OF LANDSPREADING OF LIQUID IUNICIPAL SEWAGE SLUDGE,
attelle Columbus Labs., Ohio.
or primary bibliographic entry see Field 5D.
/76-02658

NVIRONMENTAL ASSESSMENT OF FUTURE ISPOSAL METHODS FOR PLASTICS IN MUICIPAL SOLID WASTE,
attelle Columbus Lab., Ohio.
. A. Vaughan, C. Ifeadi, R. A. Markle, and H. H. rause.
vailable from the National Technical Informaon Serivce, Springfield, Va 22616. Environmenl Protection Agency, Report EPA-67012-75-058, ne 1975. 73 p, 5 fig, 15 tab, 47 ref. 1DB314 ROAP 21BFS, Task 017). R803111-01-1.

escriptors: *Plastics, *Environmental effects, Landfills, Forecasting, *Waste disposal, Solid astes, Evaluation, United States, *Municipal astes, Water pollution control.
dentifiers: *Plastic wastes.

roduction of plastics for engineering and conmer items in the United States has been preicted to reach 113 million tons per year by the ar 2000. This figure does not include the producon of polymer used for synthetic fiber or fabric. rom 31 to 38 million tons of the plastic produced expected to reach the solid waste stream, deending on the basis of estimation. The largest nount will go to sanitary landfills, and the next rgest amount will be thermally treated using such ethods as power generation, incineration, and yrolysis. Small amounts of plastic are expected to disposed of in open dumps or as litter. Resource covery for plastics in municipal refuse up to the ar 2000 is expected to be insignificant. Air pollun as a result of plastics in the landfills and open mps will be negligible, even if there is still some rning of open dumps in 2000. (EPA)
76-02659

ORIZONTAL SPREAD OF WASTEWATER IELD OVER CALM OCEAN SURFACE,
ontgomery Inc., Pasadena, Calif. M. James.
or primary bibliographic entry see Field 5B.
76-02687

TRANSFORMATIONS IN QUALITY OF RECHARGING EFFLUENT IN THE SANTA CRUZ RIVER,
Arizona Water Resources Research Center, Tucson.
L. G. Wilson, R. A. Herbert, and C. R. Ramsey.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 169-176, 3 fig, 1 tab, 14 ref.

Descriptors: *Effluents, *Arizona, *Recharge, *Groundwater recharge, *Water quality, Water pollution, Sewage, Nitrogen, Drainage.
Identifiers: *Santa Cruz River, Tucson(Ariz).

Since 1955 secondary treated effluent from the city of Tucson Treatment Plant has been released into the Santa Cruz River, the prindipal drainage tributary of the Tucson basin. Because the river is ephemeral, it has functioned essentially as an artificial recharge facility for sewage effluent. In past years the total volume of effluent artificially recharged amounted to about 31,000 ac-ft per year. Such recharge has affected not only the groundwater levels in the vicinity of the river, but also water quality. Recharge of nitrate is of particular concern. (McLachlan-Arizona)
W76-02750

AN ALTERNATIVE SEPTAGE TREATMENT METHOD: LIME STABILIZATION/SAND-BED DEWATERING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-02759

METHOD AND APPARATUS FOR DISPOSAL OF LIQUID WASTE,
PPG Industries, Inc., Pittsburgh, Pa. (Assignee).
J. D. Hummell.
United States Patent 3,748,081. Issued July 24, 1973. Official Gazette of the United States Patent Office, Vol 912, No 4, p 1490, July, 1973, 1 fig.

Descriptors: *Patents, *Waste disposal, *Incineration, Equipment.

Equipment has been patented for the disposal of burning liquid fuel waste. It consists of a vaporizing surface, disposed below a combustion zone and adapted to receive the liquid fuel. The vaporizing surface can be a movable channel extending outside of the apparatus. In operation, the fuel is introduced in liquid form and then vaporized and burned. (Sandoski-FIRL)
W76-02781

RECYCLING BRINE FROM PICKLING,
For primary bibliographic entry see Field 5D.
W76-02782

SEPARATION, DEWATERING AND DISPOSAL OF SUGAR BEET TRANSPORT-WATER SOLIDS,
American Crystal Sugar Co., East Grand Fords, Minn.
For primary bibliographic entry see Field 5D.
W76-02783

DEWATERING OF DISTILLERY SPENT WASH IN THE PRODUCTION OF BY-PRODUCT DREG MEAL,
For primary bibliographic entry see Field 5D.
W76-02784

WAYS TO AN ECONOMIC WATER USE DEMONSTRATED BY THE EXAMPLE OF A SMALL COTTON DYEING PLANT (WEGE ZUR WIRTSCHAFTLICHEN WASSERVEREWENDUNG AM BIESPIEL EINER KLEINEN BAUMOLLFAERBEREI),
For primary bibliographic entry see Field 5D.
W76-02804

FURNACE FOR BURNING SEWAGE AND LIKE RESIDUES,
Lucas Furnace Developments Ltd., Wednesbury (England). (Assignee).
J. B. Stribling.
Official Gazette, Vol 920, No 4, p 1131, March 26, 1974. United States Patent 3,799,074, Applied October 26, 1972, Issued March 26, 1974.

Descriptors: *Waste treatment, Incineration, *Patents, *Burning, *Sewage treatment, Equipment.
Identifiers: *Furnace.

A furnace for burning sewage comprising a chamber enclosing a pool of the sewage and a burner directed downwardly onto the pool to bathe the entire surface of the pool in flame has been developed. The pool has a floor which is conical in two stages so that the area of liquid subject to flame can be controlled by varying the level of the liquid relative to the conical area. (Sandoski-FIRL)
W76-02847

SEWAGE TREATMENT PLANT,
For primary bibliographic entry see Field 5D.
W76-02856

DEMONSTRATION OF A METHODOLOGY FOR DREDGED MATERIAL RECLAMATION AND DRAINAGE,
Dames and Moore, San Francisco, Calif.
C. W. Garbe, D. D. Smith, and S. Amerasinghe.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 896, $5.00 in paper copy, $2.25 in microfiche. Army Waterways Experiment Station Report D-74-5, September 1974. 91 p, 24 fig, 8 ref, 2 append. DACW39-73-C0139.

Descriptors: *Dredging, *Spoil banks, *Disposal, *Waste disposal, Desilting, Reclamation, Solid wastes, Drying, Drainage, Projects.
Identifiers: *Dredged material, Disposal areas.

A controlled field demonstration was conducted to evaluate the effectiveness of a methodology for reducing the volume and improving the physical characteristics of dredged material in confined disposal areas. The procedure involved the almost continuous conditioning of a layer of dredged material slurry by a tracked vehicle to accelerate evaporation of water in order to create a layer of soil from the slurry. The soil layer was then compacted with conventional construction equipment. A two-acre demonstration site was selected near Monroe, Michigan. The site was cleared; the in situ silty sand was compacted and leveled; and a 30-in.-high dike was constructed around the site. Material dredged from the nearby River Raisin was pumped into the test areas to a depth of 20 in. Two tracked vehicles were used to condition the slurry; a rubber-tired tractor was used for a short time. Conditioning was accomplished by operating the vehicles with the blade or bucket lowered about 3 in. into the slurry. The water content dropped from 387% to 36% after 350 coverages (23 days of conditioning). The demonstration showed the feasibility of such conditioning. Should the method be used on a large scale, special equipment should be developed for processing the slurry. The concept of partitioning a containment area into several smaller areas should be considered where staged planning would permit filling operatings in some of the areas while previously filled areas were being conditioned. (Sims-ISWS)
W76-02945

ENVIRONMENTAL CONSIDERATIONS OF SANITARY LANDFILL SITES: PART TWO,
Dames and Moore, New York.
J. A. Fischer, and D. L. Woodford.
Public Works, p 70-73, July 1973. 3 fig, 10 ref.

Descriptors: *Environmental engineering, *Landfills, *Sites, Design, Groundwater, Runoff, Garbage dumps, Topography, Surface-groundwater relationships, Water pollution control, Infiltration, Leachate, Gases, Rodents.

How to avoid environmental problems resulting from sanitary landfills are presented. When geotechnical and ecological factors have been evaluated, sanitary landfill designs can be created using favorable geologic, hydrologic, and topographic feastures of the site. Surface water diversion is usually simple. If groundwater table diversion is required, solid wastes should be placed above the maximum groundwater table; if refuse is deposited below the water table, leachate should be confined by maintaining groundwater gradients toward the landfill. Groundwater tables can rise above levels in the surrounding area due to infiltration and effects of equalizing the head on the area groundwater table. Resulting springs or seeps are nuisances but do not cause areal pollution. The final fill surface and slope can be constructed for maximum runoff to reduce infiltration. Ground- and surface water pollution should be controlled. Leachate can be transported to surface water, concentrated and collected, or retained and recovered. Groundwater should be monitored. Landfill gases can migrate thus may have to be vented. Shredding or baling refuse reduces rodent problems. Adequate cover material reduces infiltration and rodent problems. Holding ponds can be used to collect runoff and settle eroded soils. (Buchanan-Davidson-Wisconsin)
W76-02988

TALES OF AN OBLIGING LADY (SPECIAL REPORT OF SOLID WASTES: LEACHATE CONTROL).
Water and Pollution Control, Vol 111, No 12, p 15-31, 1973. 18 fig, 6 tab, 17 ref.

Descriptors: *Sites, *Landfills, *Waste disposal, *Leachate, Path of pollutants, Hydrogeology, Piezometers, Organaleptic properties, Groundwater, Observation wells, Industrial wastes, Canada.
Identifiers: State-of-the-art, Case studies, Ontario.

Knowledge of hydrogeology, geologic formations, precipitation, groundwater flow, and water tables are vital elements of landfill site selection. Leachate composition and production should be studied to measure its contamination and migration. Soil retards or fixes contaminants by dilution, dispersion, diffusion, filtration, gas exchange, sorption, chemical precipitation, coprecipitation, and microbial activity. In properly designed disposal systems, contaminants will be sufficiently attenuated before reaching a surface or groundwater resource. Site conditions and landfill design determine if refuse should be placed above or below the water table. Typical leachate characteristics are given. Landfill operations in the Grand River Basin, Ontario, are discussed. Landfill leachate decreases in strength with age. Leachate contaminated water may cause noxious odors and tastes. Well pumping can cause an effluent stream to become influent. Methane can be hazard and should be monitored. Where methane gas is high, oxygen is low. Although landfill methods are generally acceptable, problems still exist. In selecting landfill sites, municipalities should consider limitations or long term effects; installation of monitoring systems; preparation of corrective measures if problems arise; ultimate use of the site, and the best way to operate the site to reduce detrimental environmental and social impacts. (Buchanan-Davidson--Wisconsin)
W76-02989

THE COWS VS. THE SUBURBS,
Washington State Univ., Pullman. Coll. of Engineering.
For primary bibliographic entry see Field 5D.
W76-02990

5F. Water Treatment and Quality Alteration

MEMBRANE WATER DEAERATOR INVESTIGATION,
AiResearch Mfg. Co., Los Angeles, Calif.
J. Elam, J. Ruder, and H. Strumpf.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-33589, $4.00 in paper copy, $2.25 in microfiche. Report No. 74-10072, February 26, 1974. 31 p, 8 fig, 6 tab, 16 ref. NASA NAS9-10465.

Descriptors: *Membranes, *Semipermeable membranes, *Deaeration, Treatment, *Water treatment, Equipment, Laboratory tests, Membrane processes, Mathematical models, Air, Separation techniques, Evaluation.
Identifiers: *Life support systems, Hollow fiber membranes.

The purpose of the membrane water deaerator program was to develop data on a breadboard hollow fiber membrane unit that would remove both dissolved and evolved gas from a water transfer system in order to: (1) assure a hard fill of the Extra Vehicular Life Support System (EVLSS) expendable water tank, (2) prevent flow blockage by gas bubbles in circulating systems, and (3) prevent pump cavitation. An analytical model to describe the mass transfer of dissolved gas through the bulk liquid and then through the membrane wall was developed. Then a hollow fiber membrane unit was tested to determine its deaeration characteristics. Finally, a configuration for a flight unit meeting a specific problem statement was evaluated. A number of possible hollow fiber materials were evaluated; for the deaerator requirement, the most promising material was polymethyl pentene. The selection of polymethyl pentene was based on the facts that: (1) the material is a tough plastic that is spinnable into hollow fibers, (2) the permeation rate for the water vapor is low, and (3) the permeation rate for oxygen and nitrogen is high. (Sims-ISWS)
W76-02541

THE OXIDATION OF URIC ACID BY IODINE IN AQUEOUS SOLUTION,
North Dakota State Univ., Fargo. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-02632

STUDY OF CORROSION PRODUCTS IN THE SEATTLE WATER DEPARTMENT TOLT DISTRIBUTION SYSTEM,
National Environmental Research Center, Gig Harbor, Wash. Northwest Water Supply Research Lab.
For primary bibliographic entry see Field 5A.
W76-02660

APPLICATIONS OF DIRECT OSMOSIS: DESIGN CHARACTERISTICS FOR HYDRATION AND DEHYDRATION,
Arizona Univ., Tucson. Dept. of Physics.
For primary bibliographic entry see Field 5D.
W76-02745

APPLICATION OF DIRECT OSMOSIS: POSSIBILITIES FOR RECLAIMING WELLTON-MOHAWK DRAINAGE WATER,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5D.
W76-02746

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL.
Black and Veatch, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 555, $5.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-75-050a, June 1975. 106 p, 29 fig, 24 tab, 7 ref. EPA 1CB047; ROAP 21AQB; Task 024. DACW 37-74-C-0079, IAG EPA-IAG-D4-0388.

Descriptors: *Asbestos, *Lake Superior, *Filters, Minnesota, Diatomaceous earth, Water supply, Treatment facilities, *Filtration, Waste water treatment, *Water treatment, Pilot plants.
Identifiers: Mixed media filtration, *Diatomaceous earth filtration, Serpentine, *Asbestiform, Amphiboles, Chrysotile, Fiber removal, Duluth(Minn).

Pilot plant research conducted in 1974 at Duluth, Minnesota, demonstrated that asbestiform fiber counts in Lake Superior water could be effectively reduced by municipal filtration plants. During the study, engineering data were also obtained for making cost estimates for construction and operation and both granular and diatomaceous earth (DE) media filtration plants ranging in size from 0.03 to 30 mgd. Both dual and mixed-media granular filters using alum and nonionic polyer, employing flash mix and flocculation without settling and DE filters with alum coated DE as precoat and/or body feed or with Catfloc B added to raw water, produced effluents with amphibole fiber counts below electron microscope detection limits. Turbidity was not a direct measure of fiber count, but amphibole counts were generally lowest at effluent turbidities < or = to 0.1 TU. Chrysotile removal was more diffilut, but mixed media granular filtration with alum and nonionic polymer, and DE filtration with anionic polymer conditioned DE frequently reduced chrysotile fiber counts markedly. Systems for economic reasons recommended for consideration during design studies are: (1) mixed media direct filtration, 5 gpm/ft2, multiple-stage flash mix; (2) dual media filtration, 4 gpm/ft2, single stage flash mix; and (3) pressure DE filtration, 1 gpm/ft2, alum conditioning of precoats and body feed, or alum conditioning of precoat only, and cationic polymer fed to raw water. (See W76-02767 thru W76-02769) (EPA)
W76-02766

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIX A.
Black and Veatch, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 556, $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-75-050b, June 1975. 55 p, 5 append. EPA 1CB047; ROAP 21AQB; Task 024. DACW 37-74-C-0079, IAG EPA-IAG-D4-0388.

Descriptors: *Asbestos, *Lake Superior, *Filters, Diatomaceous earth, Minnesota, Water supply, Waste water treatment, *Filtration, *Dissolved oxygen, Water treatment, Data collections, Pilot plants, Weather data.
Identifiers: Mixed media filtration, Diatomaceous earth filtration, *Asbestiform, Chrysotile, Fiber removal, Duluth(Minn).

This appendix contains a portion of the data collected in the main study. The following categories of information are presented: (1) Weather and lake level data; (2) Operating schedule for pumps at the pumping station; (3) Chemical and physical quality parameters of raw and filtered water; (4) Dissolved oxygen content of raw and finished water; and (4) Bacteriological data for raw and finished water. (See also W76-02766) (EPA)
W76-02767

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IRECT FILTRATION OF LAKE SUPERIOR
/ATER FOR ASBESTIFORM FIBER
EMOVAL, APPENDIXES B AND C.
lack and Veatch, Kansas City, Mo.
vailable from the National Technical Informa-
on Service, Springfield, Va 22161 as PB-245 557,
.50 in paper copy, $2.25 in microfiche. Environ-
ental Protection Agency, Report EPA-670/2-75-
0c, June 1975. 68 p, 6 append. EPA 1CB047;
OAP 21AQB; Task 024. DACW 37-74-C-0079,
G EPA-IAG-D4-0388.

escriptors: *Asbestos, *Lake Superior, *Filters,
)ata collections, Diatomaceous earth, Water
pply, Treatment facilities, Filtration, Waste
ater treatment, Water treatment, Pilot plants.
entifiers: Mixed media filtration, Diatomaceous
rth filtration, *Asbestiform, Chrysotile, Fiber
moval, Duluth(Minn).

ppendix B contains information on the pilot fil-
rs used in the study. Data are presented on the
ysical aspects of the units (dimensions and
uipment configuration) and on the manner in
hich the filters were operated. Appendix C con-
ins data obtained during the individual pilot plant
ter runs. This kind of information will be useful
persons needing to know about specific condi-
ns such as raw water turbidity, filtration rate,
d chemical doses or diatomaceous earth types
d amounts used for precoat or body feed. (See
so W76-02766) (EPA)
76-02768

IRECT FILTRATION OF LAKE SUPERIOR
ATER FOR ASBESTIFORM FIBER
EMOVAL, APPENDIX D.
ack and Veatch, Kansas City, Mo.
vailable from the National Technical Informa-
n Service, Springfield, Va 22161 as PB-245 558,
.00 in paper copy, $2.25 in microfiche. Environ-
ental Protection Agency, Report EPA 670/2-75-
0d, June 1975. 228 p, 4 append. EPA 1CB047;
OAP 21AQB; Task 024. DACW 37-74-C-0079,
G EPA-IAG-D4-0388.

escriptors: *Asbestos, *Lake Superior, *Filters,
)ata collections, Waste water treatment, Water
pply, Treatment facilities, *Filtration,
atomaceous earth, *Water treatment, Pilot
nts.
entifiers: Mixed media filtration,
)iatomaceous earth filtration, *Asbestiform,
rysotile, Fiber removal, Duluth(Minn).

l graphs of filter head loss and effluent turbidity
functions of the number of hours of filter opera-
n are given. These graphs and the individual
er run data presented in Appendix C (W76-
768) could be used to evaluate filter per-
mance under circumstances in which the
)duction of clear, potable water is the goal,
her than the removal of asbestiform fibers. (See
o W76-02766) (EPA)
76-02769

ATER PURIFICATION.
nch Patent 2193-783, Applied July 20, 1973, Is-
d March 29, 1974. French Patent Abstracts,
15, No 17, p 3, May 31, 1974.

scriptors: *Patents, *Water purification,
larification, *Chelation, Liquid wastes, *Water
atment, Adsorption, *Waste water treatment.
ntifiers: Ligands.

elate compounds are formed when con-
inated water is purified and clarified by the ad-
on of an element. These chelates with ligands in
liquid adsorb the contamination in the liquid.
example, the ions are iron or carbon cations,
med by applying potential to an iron or carbon
ctrode immersed in the water. (Prague-FIRL)
6-02829

WATER TREATMENT ION-EXCHANGE VESSEL,
For primary bibliographic entry see Field 5D.
W76-02855

WATER SOLUBLE BLOCK POLYMERS USED AS SILT CONTROL AGENTS,
Calgon Corp., Pittsburgh, Pa. (Assignee).
R. R. Rumpf, D. E. Farley, and L. J. Quilbault.
U. S. Patent No 3,900,338, 5 p, 2 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 937, No 3, p 935, August 19, 1975.

Descriptors: *Patents, *Industrial water, *Cooling water, *Water treatment, *Water quality control, Recirculated water, Silts, Alluvium, Deposition(Sediments).

Deposits of silt and alluvium found in cooling towers, one-through cooling systems, and like impair the heat transfer capacity of the unit not only by limiting the circulation of water, but by insulating the hot metal surface to be cooled. A composition and method is described for removing and preventing accumulations of mud and silt in cooling systems in which water-soluble polymeric compositions of the A-B-A type wherein the A block represents from 10 to 100,000 mer units of a water-soluble monomer and the B block represents from 10 to 5,000 mer units of N-vinyl pyrrolidone is used as the silt control agent. (Sinha-OEIS)
W76-02991

5G. Water Quality Control

BACKGROUND INFORMATION FOR PROPOSED NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS, PETROLEUM REFINERIES, STORAGE VESSELS, SECONDARY LEAD SMELTERS AND REFINERIES, BRASS OR BRONZE INGOT PRODUCTION PLANTS, IRON AND STEEL PLANTS, SEWAGE TREATMENT PLANTS: VOLUME 2, APPENDIX: SUMMARIES OF TEST DATA.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs; and Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-229 660, $4.50 in paper copy, $2.25 in microfiche. Publication No. APTD-1352b, June 1973. 67 p, 50 tab.

Descriptors: *Air pollution, *Pollution abatement, *Industries, *Regulation, *Federal government, *Standards, Pollutant identification, Smog, Smoke, Air environment, Pollutants, Public health, Assay, Evaluation, Concrete plants, Industrial wastes, On-site tests, Environmental effects, Asphalt, Sewage treatment plants.
Identifiers: *Pollution control, *Performance standards, *Particulate matter, *Carbon monoxide, *Air standards, Asphalt concrete plants, Petroleum refineries, Lead smelter and refineries, Brass ingot production, Bronze ingot production, Iron and steel plants.

This document provided background information on the derivation of the proposed second group of new source performance standards and their economic impact on the construction and operation of asphalt concrete plants, petroleum refineries, storage vessels, secondary lead smelters and refineries, brass or bronze ingot production plants, iron and steel plants, and sewage treatment plants. Information was also provided on the environmental impact of imposing the standards. The standards require control at a level typical of well-controlled existing plants and attainable with existing technology. To determine these levels, extensive on-site investigations were conducted, and design factors, maintenance practices, available test data, and the character of emissions were considered. Economic analyses of the effects of the standards indicated they will not cause undue reductions of profit margins or reductions in growth rates. This appendix presented summaries of source tests cited in Volume 1. The summaries were concerned principally with tests for particulate matter and carbon monoxide, but also described the facilities, characteristics of exhaust gas streams, and conditions of operation. (Henley-ISWS)
W76-02543

THE EFFECTS OF CURRENTS AND WAVES ON AN OIL SLICK RETAINED BY A BARRIER,
Texas A and M Research Foundation, College Station.
L. A. Hale, D. J. Norton, and C. A. Rodenberger.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-004 675, $9.75 in paper copy, $2.25 in microfiche. United States Coast Guard Report CG-D-53-75, April 1974. 319 p, 150 fig, 19 tab, 56 ref, 1 append. DOT-CG-23357A.

Descriptors: *Oil spills, *Oil pollution, *Currents(Water), *Waves(Water), Oil, Barriers, Oil-water interfaces, Laboratory tests, Oil wastes, Pollutants, Water pollution control, Pollution abatement, Water pollution.
Identifiers: *Oil slicks, Oil slick control, Oil slick behavior, Oil slick flume tests, Oil slick shielding, Fast current oil slick control.

Experimental studies were conducted on the behavior of a floating oil slick subjected to various external mechanical influences and to the action of currents and waves. Specifically, studies were made of the behavior of a thick slick, retained by a barrier, subjected to currents and waves, and subjected to the influence of various slick shield devices. Studies were also made of the effects on a moving thin slick of energy absorbing barriers and various other slick control devices. The laboratory experiments closely duplicated prototype conditions except for wave size. The results of this investigation clarify many previous misconceptions of thick slick behavior and introduce several new concepts of slick behavior including a mathematical model describing the entrainment loss phenomena. Oil diversion schemes, rapid removal schemes, and energy absorption barriers were evaluated in terms of their effect on thin slick behavior at high current velocities. (Sims-ISWS)
W76-02549

ENGINEERING DESIGN HANDBOOK, ENVIRONMENTAL SERIES, PART ONE, BASIC ENVIRONMENTAL CONCEPTS.
Army Materiel Command, Alexandria, Va.
For primary bibliographic entry see Field 6G.
W76-02550

WATER QUALITY MANAGEMENT PLANNING FOR THE ROARING FORK RIVER BASIN IN WESTERN COLORADO,
California Univ., Los Angeles.
J. K. Hopkins.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No 75-16786. PhD Thesis, 1975, 254 p.

Descriptors: *Water management(Applied), Water resources development, *Colorado, Colorado River Basin, River basins, Water quality control, Urban runoff, Model studies, Planning, Computers, Analytical techniques, Capital costs.
Identifiers: Roaring Fork River basin(Colo).

The Water Quality Management Plan for the Roaring Fork River Basin in Western Colorado has been developed. This plan provides a baseline survey of existing water quality in the area, and has been adopted by the Colorado Water Quality Control Commission to become an element of the Colorado River Basin Plan. The investigation in-

cludes the development of a computer model of the basin for the assessment of future water quality, and the analysis of needs and capital expenditures required to maintain high water quality. The Plan also recommends waste load allocations for segments of the Basin. In addition to describing the Water Quality Management Plan, the dissertation presented here described control and treatment of urban runoff in Aspen, Colorado, and analyzes the significance of the contribution of urban runoff to stream degradation. (Kramer-FIRL)
W76-02563

LARGE SYSTEMS APPROACH TO WATER QUALITY MODELLING AND MANAGEMENT,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5B.
W76-02564

DISTRIBUTED PARAMETER SYSTEMS APPROXIMATION FOR ESTUARINE WATER QUALITY MODELLING AND CONTROL,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5B.
W76-02565

OIL SPILL DETECTOR.
For primary bibliographic entry see Field 5A.
W76-02581

DISPERSING OIL IN WATER WITH ALKYDS CONTG. POLYALKYLENE GLYCOL.
Belgian Patent BE 824-514. Issued July 17, 1975. Derwent Belgian Patents Report, Vol W, No 31, p H1, September 9, 1975.

Descriptors: Waste water treatment, *Industrial wastes, *Oily water, Secondary recovery, *Patents, Chemical reactions, Polymers, *Water pollution control, Dispersion.

A patent has been issued for a method of dispersing oil in water with alkyds containing polyalkylene glycol. The alkyd is the reaction product of a polybasic acid, a poly-alcohol, and a monobasic acid. The poly-alcohols which can be used are mono-, di-, or tri-ethylene, -propylene, or -butylene glycols, neopentyl glycol, glycerol, trimethylol-propane or -ethane, (di)pentaerythritol, sorbital, polypropylene glycol or polybutylene glycol. The polyalkylene glycol is polyethylene glycol or poly(ethylene/propylene) glycol, with a molecular weight between 100 and 10,000, preferably between 400 and 5,000. The terminal OH of the polyalkylene glycol may be etherified with an alcohol containing one to six carbons. The alkyd contains not less than 5C, preferably not less than 10C. The polyacids may be phthalic acids, maleic, adipic, glutaric, or trimellitic acids. The monobasic acids can be tall oil acids, or acids from tung oil, soya oil or fish oil. The process is used to disperse oil on water surfaces, in secondary oil recovery, for recovering oil from tar sands, and in the solvent-cleaning of tanks and pipelines. The dispersed oil droplets do not easily recombine. (Orr-FIRL)
W76-02583

WATER QUALITY DETERMINATION APPARATUS,
Kabushiki Kaisha Meidensha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5A.
W76-02596

SMALL BOAT OIL REMOVAL SYSTEM FOR BILGE WATER,
For primary bibliographic entry see Field 5D.
W76-02598

APPARATUS FOR REMOVING OIL FROM WATER,
Conwed Corporation, St. Paul, Minn. (Assignee).
G. H. Sundin, F. H. Riedel, W. R. Niemi, and R. C Slocumb.
U.S. Patent No 3,915,859, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2092, October 28, 1975.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Oily water, *Absorption, Sectivity, *Separation techniques, Equipment, Cellulose.
Identifiers: Sensors.

An apparatus is provided for the continuous separation os oil and water. The oil-water mixture is enclosed within a spool. A sheet of selectively absorbent material is wrapped around the spool. The material is capable of passing one of the fluids and of retaining the other fluid. It is also flexible and has structural integrity so as not to tear or hydraulically erode in operation. Cellulose fiber mats are suitable. The mats are composed of wood fiber held together with a water resistant binder such as a phenolic and are reinforced with plastic net to give tensile strength. The spool is rotated while the absorbent material is advanced. As the oil-water mixture is introduced into the spool, the water passes through the absorbent material and the oil is absorbed by the material. An automatic sensor activates a drive shaft to advance the oil laden absorbent material as it becomes saturated and new material is moved into place. (Sinha-OEIS)
W76-02608

VESSEL FOR REMOVING LIQUID CONTAMINANTS FROM THE SURFACE OF A WATER BODY,
Costruzioni Battelli Disinquinanti S. p. A., Rome (Italy). (Assignee).
O. Massei.
U. S. Patent No 3,915,864, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2094, October 28, 1975.

Descriptors: *Patents, *Oil pollution, Oil spills, *Water pollution control, Water pollution treatment, Oily water, *Separation techniques, Boats, Pontoons.

A system is provided for removing contaminant liquid of lower density than water from the surace of a body of water. The surface layer of the water is conveyed into an inverted channel beneath the surface of the water and vortices are formed for the accumulation of the contaminant liquid. A vessel is provided which has at least two pontoons containing tanks for the collection and decantation of the contaminant liquid. The hull of the boat extends between the pontoons in a V shape so that the liquid displaced by the hull is deflected into a downward open channel. A number of spaced apart ribs at the stern of the vessel direct fluid to be collected into collecting channels. By the application of suction the accumulated liquid is transferred into the collection and decanting tanks in the pontoons. (Sinha-OEIS)
W76-02611

DEVELOPING A CORPORATE RESPONSE TO POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass. School of Business Administration.
S. C. Wheelwright.
European Business, p 64-72, Summer 1973.

Descriptors: *Pollution abatement, *Industries, Decision making, Standards, Planning, Management.
Identifiers: Corporate pollution policy.

While public opinion, existing and proposed legislation, employee safety considerations, and rising waste management economics have prompted corporations to engage in environmental protection activities, existing corporate management structures have slowed its implementations. A survey of eight corporations (seven of the multinational) with sales in excess of $100 million each illustrates several factors ranging from inefficient processes to those inherent in the existing management system. The pollution problem definition is also clearly related to corporate growth and previous expertise. Also the location of the waste problem within the management framework and the goals of the respective decision makers affect the implementation of any solution. The corporate structure's allocation of responsibility and authority are further determiners of implementation. The total environment, corporate-industry, and public also provide impetus towards discovering and implementing environmental protection plans. Today's corporate structure must be adjusted. First, it must make policies as to the degree of compliance at different plant locations. Allocation of funds between research, pollution control devices and investments must be made. Second, the corporate structure must clearly allocate responsibility and authority, although such allocation may be evolutionary rather than static. (Schroeder-Wisconsin)
W76-02613

COASE, SOCIAL COST AND STABILITY: AN INTEGRATIVE ESSAY,
California Univ., Los Angeles. Urban Planning Programs.
For primary bibliographic entry see Field 6C.
W76-02616

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: PETROLEUM REFINING INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 336, $5.00 in paper copy, $2.25 in microfiche. Report No EPA-230/2-74-020. December 1974. 82 p, 9 fig, 15 tab.

Descriptors: *Pollution abatement, *Waste water treatment, *Oil industry, *Economic impact, Marketing, Industrial production, Competition, Foreign countries, Distribution, Federal government, Technology, Employment, Water conservation, Pricing.
Identifiers: Oil refineries.

The potential economic impact of the U.S. petroleum refining industry of effluent limitation guidelines and standards of performance that have been established by the EPA Environmental Protection Agency is evaluated. A detailed description of the petroleum refining industry is given, covering the product, market and distribution, government influence, operations, financial structures, utilization rates and trends for the future in financial structure and refinery technology. The costs of treating waste water, and of in-plant reduction of waste water flow, are analysed in some detail, particularly in relation to the effects that these costs will have no profitability and effects on the growth of the industry, employment and adjacent communities. Conclusions about the impact of these costs depend largely upon the assumed form of government involvement in the industry. If U. S. refineries are permitted to compete domestically, but are protected from world competition, the impact may be minimal. On the other hand, continuing current controls on the margin (product revenue less crude costs) realized by large refineries may create problems for many small refineries which will incur much greater unit cost increases than large refineries. (Carpenter-Wisconsin)
W76-02618

ECONOMIC DISINCENTIVES FOR POLLUTION CONTROL: LEGAL, POLITICAL, AND ADMINISTRATIVE DIMENSIONS,
Environmental Law Inst., Washington, D. C.

LIBRARY U. OF I. URBANA CHAMPAIGN

/. A. Irwin, and R. A. Liroff.
vailable from the National Technical Informa-on Service Springfield Va 22161 as PB-239 340, 0.00 in paper copy, $2.25 in microfiche. Report o EPA-600/5-74-026, July 1974, 273 p, 16 append. 8-01-2203.

escriptors: *Pollution abatement, *Pollution xes(Charges), *Legal aspects, *Penalties(Legal), ederal government, State governments, Europe, nited States, Legislation, Taxes, Regulation, Ju-icial decisions, Feasibility, Political aspects. lentifiers: *Pollution disincentives.

definition of an economic disincentive is resented as a monetary charge levied by govern-ent on conduct which is not illegal but which es impose social costs, for the purpose of scouraging that conduct. Disincentives should be istinguished from fines, civil penalties, user harges, license fees, etc., which may have in-dental economic disincentive effects. Particu-rly, pollution charges in Vermont and surveil-nce fees in Michigan are shown not to be disin-entives but rather fines and user charges, respec-vely. The constitutionality of federal or state im-osition of disincentives is examined and the thority of the Environmental Protection Agency d the states to utilize disincentives under lected environmental statues is analyzed. The llowing are also discussed in detail; (1) The gality of some disincentives adopted by states;) charges imposed by some European countries d the difference between these charges and dis-centives; (3) the history of some previous roposals for federal disincentives and the politi-l and administrative dimensions of these; and (4) me suggestions for additional disincentives and eir feasibility. It is proposed that disincentives e a promising new mechanism for governing pol-tion and should be carefully considered. arpenter-Wisconsin)
76-02619

APITAL INVESTMENT FOR WATER POLLU-ION CONTROL AT THE STATE AND LOCAL EVEL,
rumkin (Norman), Washington, D. C.
. Frumkin.
vailable from the National Technical Informa-n Service Springfield Va 22161 as PB-228 030, .00 in paper copy, $2.25 in microfiche. Environ-ental Protection Agency, Washington, D.C. Of-e of Planning and Evaluation. Report August 72, 91 p, 5 tab, append 68-01-0164.

escriptors: *Water pollution control, *Sewage eatment, *Investment, *State governments, rants, Facilities, Administration, Mas-chusetts, New York, Ohio, Maryland, Alabama, xas, New Mexico, California, Washington, cal governments, Federal government, Priori-s, Regional analysis, Project planning.

survey of nine state programs was conducted to termine existing priorities, problems, and ap-oaches to water pollution control. Interviews re conducted primarily with the engineer in arge of the construction grant programs in Mas-chusetts, New York, Ohio, Maryland, Alabama, xas, New Mexico, California, and Washington. estions posed centered on: (1) The state's pri-ities for water pollution control capital construc-n; (2) factors emphasized in allocating state nds to municipalities; (3) penalties and incen-es used by the state to motivate local action; (4) e-year projections of state capital expenditures r treatment of facilities; (5) quality and capacity ndards incorporated in the proposed facilities; factors expected to affect cost and timing of proposed construction; (7) expected demand r treatment facilities; (8) review procedures local atment facilities utilized by the state. The sur-y indicates that municipalities play a major role the states' investment programs. The states' licy emphasis centers on the provision of treat-nt facilities in the shortest possible time. Often this policy objective is in conflict with the implementation of the optimal technology and regionalization. The state utilizes encouragement, pressure, legislation and litigation to accomplish policy objectives. State by state profiles are given for each of the questions. (Schroeder-Wisconsin)
W76-02620

THE DELAWARE ESTUARY SYSTEM, ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC EFFECTS: ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-231 424, $4.50 in paper copy, $2.25 in microfiche. Report No NSF-RA-E-74-001, January 1974. 47 p, 9 fig, 1 tab, 79 ref. NSF-RANN GI 33369.

Descriptors: *Environment, *Water quality, *Value, *Evaluation, Attitudes, Analytical techniques, Social aspects, Welfare(Economics), Ethics, Recreation, Ecosystems, Urbanization, Aesthetics, Planning, Intangible costs, Intangible benefits, Economics.

The state-of-the-art analysis of the many different approaches to evaluating environmental quality and with particular reference to water-related environments is discussed. A wide spectrum of related methodology and concepts, including biological, anthropological, religious, aesthetic, philosophic and literary writings are considered in addition to the usual engineering considerations, economic factors and systems analysis methodology. Some approaches are shown to be basically inadequate or without logical merit, while the categorization of environmental quality as 'recreation' or 'aesthetic values' is too narrow. The economists' definitions of 'welfare', 'value', and 'utility' theories as related to optimization of environmental quality are reviewed and criticized, with the conclusion that the problem of evaluation is not insuperable. It is possible to describe relevant parameters and to evaluate them in many money terms, and physical standards can be set for achieving social objectives. The basic environmental objective is not a categorical imperative but can have tradeoffs with other social goals, with marginal economic advantages. (Carpenter-Wisconsin)
W76-02626

LOWER SHEYENNE RIVER BASIN WATER - LAND - PEOPLE.
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 5A.
W76-02627

OPTIMIZATION OF WATER ALLOCATION, WASTEWATER TREATMENT, AND REUSE CONSIDERING NON-LINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-02636

CONFERENCE ON THE MANAGEMENT OF RECREATIONAL LAKES.
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 6B.
W76-02641

UPGRADING LAKES--LAKE RENEWAL AND MANAGEMENT TECHNIQUES,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
T. L. Wirth, and S. M. Born.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 40-41.

Descriptors: *Recreation, *Management, *Lakes, Techniology, Deterioration, Nutrient removal, Eutrophication, Sedimentation, Aquatic weed control, Oxygenation, *Wisconsin, Dredging.
Identifiers: *Lake rehabilitation.

Lake degradation in the upper Midwest is largely due to acceleration of eutrophication and sedimentation generated by human activities. When these processes speed up, algal blooms, rooted aquatic plant growth, sediment infilling, and declining fisheries occur. Improvement programs could reduce excessive plant growth and improve water quality, but lakes are complicated ecosystems thus their response to treatment is difficult to predict. Many restoration schemes are expensive; years of data are needed to define problems; remedial programs require time; and public institutions are not well structured to implement these programs, thus public demands and expectations are not satisfied. Reduction of sedimentation from the watershed, dredging, and retarding eutrophication help reduce sediment accumulation. Waste water diversion, nutrient removal from effluents, land-use management, and product modification can curb nutrient input. Inlake correction methods include chemical inactivation of nutrients; harvesting biota, dilution, flushing, subaerial exposure and drying, bottom sealing, hypolimnion withdrawal, and dredging. Overfertilization products can be treated by mechanical, chemical, physical, and biologic methods. Mechanical aeration of whole lakes or the hypolimnion and lake deepening are promising methods. Lake upgrading requires public understanding, support, and participation; and is expensive, difficult, and slow. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02645

UPGRADING LAKES--LAND-WATER RELATIONSHIPS,
Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
J. Peterson.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 42-46.

Descriptors: *Recreation, *Lakes, *Water quality control, Water management(Applied), Drawdown, Diversion, Pumping, Oxidation, Sediments, Oxygen demand, Aquatic weed control, Lake sediments, Nutrient removal, Compaction, Dredging, Sediment control, Erosion control, Land management, Urban drainage, Zoning, Waste disposal, Sewage treatment, Secondary treatment, Tertiary treatment, *Wisconsin.
Identifiers: *Lake rehabilitation.

Following dewatering of an impoundment by drawdown, diversion, or pumping, oxidation of the sediments lowers oxygen demands in the water, bottom sediments become desiccated, rooted aquatic plants are controlled, nutrient transfer is limited, and compaction of sediments occurs. Dredging treats the symptoms, not the basic cause; dredging requires spoil disposal, is expensive, and its effects on water quality are unknown. Erosion control by management of agricultural land, gravel mining operations, and urban drainage is preferable. Shoreland zoning regulations include subdivision regulations to protect water resources, zoning codes to preserve wet lands and fragile environments, and sanitary codes to control onsite disposal to prevent water contamination. Sediments and nutrients must be controlled. Diversion can be used for waste disposal, but this does not solve the problem unless the natural system downstream can handle the waste products adequately. Waste treatment techniques can also be used, such as primary methods to remove solid materials and pathogens, secondary methods to reduce oxygen and biochemical ox-

ygen demands, and tertiary methods to reduce nitrogen and phosphorus outputs to limit aquatic plant production. The total environmental effect of lake renewal and management must be considered. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02646

AQUATIC VEGETATION HARVESTING,
Dane County Dept. of Public Works, Madison, Wis.
For primary bibliographic entry see Field 4A.
W76-02647

ALTERNATIVES TO PROTECT AND ENHANCE LAKES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
D. A. Yanggen.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 73-82.

Descriptors: *Protection, *Lakes, *Recreation, *Lake shores, *Water quality, Sedimentation, Eutrophication, Management, Comprehensive planning, Land use, Wisconsin, Regulation, Local governments, Land development, Competing uses, Erosion control, Boats, Zoning, Cooperatives, Building costs.
Identifiers: Lake rehabilitation, Recreational subdivisions.

Lakes and their shorelines face many threats. Water quality problems caused by sedimentation and over-enrichment can sometimes be prevented or corrected by lake renewal and management techniques. Improper uses of shorelands and their consequent deterioration can affect water quality. A shore buffer zone must be guarded by careful protection and planning. Conflicts in surface water use can be reduced by regulations to make aquatic recreation safer by zoning according to use of a fixed area, separating distance between uses, and time; and/or prohibiting certain uses. Individuals can be effective in some lake protection programs; collective action by property owners may be more effective in some areas; and governmental action at various levels may be required in other areas. Advantages and potential problems of recreational developments containing individually owned sites and shared open spaces and facilities are discussed. Property owners' associations can help deal with some problems, such as control of individual lot architectural and environmental development, management and maintenance of open space and recreational facilities, and provision of services. Declarations of covenants and restrictions, articles of incorporation and bylaws of property owners' associations, the final subdivision plat, and the deed of conveyance are all important in effectuating the development plan. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02648

LAKES AND WISCONSIN'S FUTURE,
Wisconsin Office of the Governor, Madison. Lieutenent Governor.
For primary bibliographic entry see Field 6E.
W76-02652

ENVIRONMENTAL ASSESSMENT OF FUTURE DISPOSAL METHODS FOR PLASTICS IN MUNICIPAL SOLID WASTE,
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 5E.
W76-02659

SULFURIC ACID FOR REDUCING SODIUM HAZARD OF IRRIGATION WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-02666

STRIP MINING AND RECLAMATION ON THE BLACK MESA OF ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
T. R. Verma, J. L. Thames, and R. T. Pattern.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 47-65, 7 fig, 3 tab, 3 ref.

Descriptors: *Strip mines, *Land reclamation, *Semiarid climates, *Soil conservation, *Water quality, Strip mine wastes, Water pollution sources, Water pollution, Mining, *Arizona, Conservation, Land management, Soil erosion, Land use, Precipitation(Atmospheric), Vegetation, Runoff, Groundwater, Infiltration, Small watersheds, Erosion control, Sediment control.
Identifiers: Black Mesa(Ariz).

Important goals of reclamation on the Black Mesa area of Arizona are: (1) to maximize the water available from precipitation for use by vegetation and/or people and livestock; (2) to reduce the contribution of surface water, which may not be of suitable quality, to the ephemeral streams of the region; and (3) to lessen or facilitate (depending on water quality) deep seepage into groundwater. From a two-year study on a small 5.5-acre watershed in the Black Mesa area, it was found that mined-land reclamation in the semiarid West is significantly different from the reclaimed lands in the humid East. The quality of the surface runoff from the reclaimed mine spoils compares well with proposed Environmental Protection Agency criteria and water from a nearby Indian well. The authors conclude that reclamation should be aimed at erosion and sediment control through land stabilization. As more data is gathered many alternatives for land use and modification can and should be considered, and decisions can then be made using a systems approach incorporating social, economical, ecological, and other related hydrological and biological aspects. (Robinett-Arizona)
W76-02670

WATER RESOURCES MANAGEMENT FOR PART OF THE LOWER GILA VALLEY,
Arizona Univ., Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 3F.
W76-02678

MANAGEMENT FOR THE CONTROL OF SALTS IN IRRIGATED SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-02679

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1973.
Australian Water Resources Council Canberra.
For primary bibliographic entry see Field 2A.
W76-02680

GROUNDWATER POLLUTION CONTROL IN AN INDUSTRIALIZED PART OF THE TRENT BASIN,
Trent River Authority (England).
L. H. Dowse, and K. H. Selby.
Water Pollution Control, Vol 74, No 5, p 526-543, 1975. 6 fig, 6 tab, 17 ref.

Descriptors: *Water pollution control, *Industrial wastes, *Groundwater, Aquifers, Pumping, Pollutants, Classification, Monitoring, Wells, Shafts(Excavations), Waste disposal, Sites, On-site investigations, Legislation, Water quality, Water pollution sources, Pre-treatment(Water).
Identifiers: *United Kingdom, *Trent basin, Tips, Pits, Triassic sandstones, Coal measures, Case histories, Surveillance.

This paper was concerned with ways to protect underground water resources in an industrialized part of the Trent area. Problems encountered were outlined. The area is very heavily populated and is also the most highly industrialized part of the United Kingdom. Coarse-grained, poorly cemented Triassic sandstones are the most significant aquifers in the Upper Tame basin. The coal measures series, while much less permeable than the Triassic sandstones, also contains important aquifers. Groundwater is of the calcium bicarbonate type and typically is very hard. Present basinwide pumpage from these aquifers totals 9,670,000 cu m/yr. Factors which control the migration and persistence of pollutants in groundwater are hydrological, physicochemical, and biological. Sources of groundwater pollution include: industrial waste disposal on tips or in abandoned pits; direct discharge into underground strata through wells and mine shafts; accidental causes, such as leakage and spillage; and natural causes. Two types of surveillance have been put into practice by the Trent River Authority: a broadscale license-based system and a localized, intensive investigatory system. The suitability of potential tipping sites was studied and assessments made of the pollution risks. In addition, a classification has begun of wastes and existing disposal sites. (Visocky-ISWS)
W76-02691

AGRICULTURAL RUNOFF POLLUTES SURFACE WATERS, PART I,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-02694

BACTERIOLOGICAL QUALITY OF SURFACE RUNOFF FROM AGRICULTURAL LAND, PART II,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-02695

SIMULATED BEEF FEEDLOT BEHAVIOR UNDER ALTERNATIVE WATER POLLUTION CONTROL RULES,
Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
D. L. Forster.
American Journal of Agricultural Economics, Vol 57, No 2, p 259-268, May 1975. 1 fig, 5 tab, 13 equ, 17 ref.

Descriptors: *Water pollution control, *Feed lots, *Simulation analysis, Behavior, Agriculture, Prices, Methodology, Legislation, Decision making, Optimization, Economics, Farms, Equations, Michigan, Rainfall, Cattle, Environmental control, Pollution abatement, Farms, Mathematical models, Systems analysis.
Identifiers: Control rules, Direct search method, Coarse grid approach, Cost minimization, Sensitivity analysis.

Rules are being established by federal and state agencies to control water pollution from feedlots. In order to investimate the impact of alternative rules, a simulation model was constructed to represent the behavior of beef feedlots in Michigan and similar states over the 1974-85 period. Individual firm behavior was simulated as the firm formed expectations concerning ex ante producution relationships and input and output prices, made decisions based on these expectations, and had its success determined by ex post production relationships and input and output prices. A decision-making process determined the type and level of inputs employed and was used

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ach time period by each simulated firm. An optimization procedure was used to find the values of four unknown parameter values (initial net worth, rate of return on off-feedlot investments, he determinants of the amount of depbt, and the annual user costs of durable assets). The procedure employed the direct search method and a coarse grid approach. Results indicate that while he alternative rules would not have severe impacts on feedlot production, their impacts would e regressive. (Bell-Cornell)
W76-02720

MODELS IN WATER RESOURCES,
For primary bibliographic entry see Field 6A.
W76-02722

EFFECTS OF SURFACE CONFIGURATION IN WATER POLLUTION CONTROL ON SEMIARID SURFACE MINED LANDS,
Montana State Univ., Bozeman. Dept. of Animal nd Range Sciences.
. B. Jensen.
n: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, 739-749, 2 tab, 3 ref.

Descriptors: *Erosion, *Water pollution, Vegetation establishment, *Soil moisture, *Spoil anks, *Land forming, Slopes, Grading, Slope rotection, Soil erosion, Sediment control, Soil urfaces, Infiltration, Strip mine wastes, Land anagement, Runoff, Soil conservation.
dentifiers: Gouging, Dozer basins, Deep chisel-ig.

he generally smooth surfaced, recontoured ter-in being left in the wake of strip mining normally rovides no depression for impeding runoff but in-ead, rapidly funnels sediment and nutrient rich xcess runoff into the adjacent streams and gul-es. Large amounts of the water falling on smooth rfaced recontoured terrain are being completely st to vegetation establishment and development. he three surface manipulation treatments which e discussed include gouging, dozer basins, and ep chiseling on sloping freshly shaped spoils. tudies conducted over several years show the ouging treatment (applied at the approximate ntour of the shaped spoils forming elongated ts about 14-16 inches wide, 2-3 feet long and 6-8 ches deep) stored more water in the upper 4 feet il, significantly reduced soil moisture stress ys, and resulted in better plant survival than did e other treatments. The dozer basin treatment d a higher plant mortality rate (31 percent) than e other two treatments but maintained greater ant density than did the chiseling treatment. obinett-Arizona)
76-02726

ALT BALANCE IN GROUNDWATER OF THE ULARE LAKE BASIN, CALIFORNIA,
r primary bibliographic entry see Field 4B.
76-02751

ATER QUALITY MANAGEMENT PLANNING OR URBAN RUNOFF,
RS Research Co., San Mato, Calif.
r primary bibliographic entry see Field 5D.
76-02758

LLUTION ABATEMENT FROM CATTLE EDLOTS IN NORTHEASTERN COLORADO D NEBRASKA,
ricultural Research Service, Fort Collins, Colo.
r primary bibliographic entry see Field 5D.
'6-02762

LAKE CLASSIFICATION--A TROPHIC CHARACTERIZATION OF WISCONSIN LAKES,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 2H.
W76-02764

ECOLOGICALLY ACCEPTABLE METHOD OF BREAKING MINERAL OIL EMULSIONS-SUSPENSIONS,
American Cyanamid Co., Stamford, Conn. (Assignee).
E. A. Vitalis, and R. J. Chamberlain.
United States Patent 3,756,959, Issued September 4, 1973. Official Gazette of the United States Patent Office, Vol 914, No 1, p 282-283, September, 1973. 1 fig.

Descriptors: *Patents, *Emulsions, Waste water treatment, *Oil-water interfaces, Polyelectrolytes, Separation techniques, Industrial wastes, Surfactants, Water pollution control.

An ecologically acceptable method of breaking mineral oil emulsion-suspension has been patented. A variety of petroleum suspensions of the oil-in-water, water-in-oil types, particularly those containing finely divided solid suspended matter are separated into an economically valuable mineral oil fraction low in suspended solids and water and an ecologically acceptable waste water. The method employs a high molecular weight water soluble polyelectrolyte and at least one surfactant such as an alkyl sulfosuccinate. Other polyelectrolytes and surfactants are effective with a wide variety of such emulsion-suspensions, resulting in an ecologically sound separation technique. A water soluble surfactant, such as sodium isopropylnaphthalene sulfonate an oil surfactant, such as sodium di(2-ethylhexyl)sulfasuccinate, and a high molecular weight polyacrylamide of up to about 20 million molecular weight, potentiate and synergistically aid each other. The addition of heat to thin the oil layer, if it is viscous, produces particularly advantageous results. (Sandoski-FIRL)
W76-02775

FLUID RECOVERY APPARATUS,
R. T. Headrick.
Canadian Patent 928,184, Issued June 12, 1973. Patent Office Record, Vol 102, No 24, p 1962, June, 1973.

Descriptors: Waste water treatment, *Oil spills, *Industrial wastes, Equipment, *Patents, Water pollution control, Oil pollution.

An apparatus for restricting and recovering petroleum products discharged near the bottom of a body of water has been patented. A submerged collector is positioned near the discharge point of the petroleum to restict its travel, an accumulator provides remote storage of the petroleum restricted in the submerged collector, and a conduit provides for flow of the petroleum from the collector to the accumulator. (Sandoski-FIRL)
W76-02778

AERATION DIFFUSER.
French Patent 2,184,426, Applied May 16, 1972, Issued February 1, 1974. French Patents Abstracts, Vol 5, No 8, p 1, March, 1974.

Descriptors: *Waste water treatment, *Patents, *Aeration, *Diffusion, Gases, Liquid, Air, Oxygen, Water purification, Lakes, Rivers, Water pollution treatment, Equipment.
Identifiers: *Aerator.

An aeration diffuser was developed for the diffusion of a gas into a relatively large volume of liquid, particularly diffusion of air or oxygen into polluted lakes or rivers deficient in dissolved oxygen. The gas is delivered into the liquid by a small aperture to form a small bubble. The bubble is driven into the mass of liquid before its formation is complete by a flow of liquid past the aperture at a speed which is preferably less than that of the liquid past the aperture. (Merritt-FIRL)
W76-02824

OIL RECOVERY FROM OIL-CONTAMINATED WATER.
Netherlands Patent 7313-109, Applied September 24, 1973, Issued March 27, 1974. Derwent Netherlands Patents Report, Vol 5, No 15, May, 1974.

Descriptors: *Patents, *Water purification, *Oil spills, *Oceans, *Water pollution control, Equipment.
Identifiers: Oil slicks.

Purification of water, such as from oil slicks at sea, is accomplished by an apparatus with a floating body and inlet openings as well as a collecting chamber for the contaminated water. This chamber has a cover which comes partly or wholly into contact with the oil-contaminated water surface and is provided with an oil uptake device. The cover is arched and the oil uptake device may be a discharge channel or a suction unit, which is installed at the crest of the arch. (Prague-FIRL)
W76-02830

OIL RECOVERY FROM SPILLS ON WATER.
Netherlands Patent 7212-980, Applied September 26, 1972, Issued March 28, 1974. Derwent Netherlands Patents Report, Vol 5, No 15, May, 1974.

Descriptors: *Patents, *Oil, *Oil spills, Floating, Equipment, Weir, Flow, Water pollution control.
Identifiers: *Oil recovery, Floating oil skimmer.

A box-like structure, supported on detachable buoyant pontoons along each side, contain inlet equipment: an oil water separation zone; an oil collection sump; and water outlet facilities. This floating oil skimmer is easily dismantled and transported for recovering oil from water surfaces. An inlet at the open front end of the skimmer is arranged so that the skimmed water-oil mixture runs back down a slope from an adjustable lip device. The separation zone includes an adjustable weir at the bottom of the slope over which the separated oil can flow. (Prague-FIRL)
W76-02831

REMOVING OIL SUBSTANCES FROM WATER, ROADS, TOOLS AND MACHINES,
T. Or, II, and M. Watanabe.
French Patent 2,172,336, Applied February 16, 1972, Issued September 28, 1973. French Patents, Food, Disinfectants, Detergents (U50), p 4, January 17, 1974.

Descriptors: *Patents, *Water pollution control, Waste treatment, Waste water(Pollution), *Oil spills, Liquid wastes, *Oil wastes, Municipal wastes.

The preparation of a mixture of halohydracarbons containing non-ionic surfactants and their application in removing oily substances from water, roads, tools, and machines are described. The composition consists of a mixture of not less than two percent of methylene chloride, perchloroethylene, trichloroethylene, and carbon tetrachloride with 3-12 percent of the total composition, of a nonionic surfactant of the polyoxyethylene type. The composition has high emulsifying, dispersing, and stripping power, is nonflammable and can be stored safely. A homogeneous, stable, emulsified dispersion of oils is formed in (sea) water. The composition can be used to disperse oil on the sea or other water surfaces, to remove oil from roadways, or to remove oil from tools and machine. (Merritt-FIRL)
W76-02849

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COALESCING OIL/WATER DISPERSIONS.
French Patent 2,176,682, Applied March 17, 1973, Issued November 2, 1973. French Patents Abstracts, Vol 5, No 1, p 1, February 7, 1974.

Descriptors: *Dispersion, *Coalescence, *Oil, *Separation techniques, Pollution abatement, Waste water treatment, *Patents.
Identifiers: Polyurethane foam.

A dispersion of a hydrocarbon oil and water is coalesced by slow passage through a bed of polyurethane foam which has been equilbrated relative to the absorption of the oleophilic liquid. The layers of oil and water are then separated at a density of 0.012-0.12 kg/cu dm, temperature of 0-100 C, and at a pressure sufficient to keep the oil in a liquid state. Applications include pollution prevention recovery of oils from residual water in oil drilling operations, separation of phenolics in wood treatments, etc. By using an equilibrated polyurethane foam a separation squeezing process for the oil is eliminated. (Merritt-FIRL)
W76-02853

REMOVING OIL SPILLS FROM WATER.
French Patent 2,177,100, Applied March 23, 1973, Issued November 2, 1973. French Patents Abstracts, Vol 5, No 1, p 2, February 7, 1974.

Descriptors: Adsorption, *Oil, Solvents, Organic compounds, Sand, Cleaning, Waste water treatment, *Patents, *Water pollution control.
Identifiers: Polystyrene foam.

A method of removing oil spills from water by absorbing the oils in pieces of foam polystyrene in which the cells have been opened by shredding is described. The polystyrene has a density of 1.4-2.0 lbs/cu ft, average cell size 1.0-3.0 mm, and is capable of adsorbing about 19 times its weight of crude oil. The oil can be subsequently recovered by treatment with a solvent (MED, MIBK, acetone, benzene, toluene, xylene, carbon tetrachloride, perchloroethylene or trichloroethylene) to dissolve the polymer. The polymer particles are preferably coated with a fire retardant before use. The method may also be used for cleaning contaminated sand, for transportation of oil and emulsified oils, and tank cleaning. (Merritt-FIRL)
W76-02854

AN ECONOMIC EVALUATION OF ALTERNATIVE SEWERAGE PRICING AND INVESTMENT PRACTICES: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
N. W. Bouwes, Sr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 431, $9.00 in paper copy, $2.25 in microfiche. Ph.D. Thesis, 1975. 246 p, 37 tab, 20 fig, 80 ref, 2 append. OWRT B-087-WIS(1). 14-31-0001-4139.

Descriptors: Water management(Applied), *Economic efficiency, *Pricing, *Investment, Economics, *Discreminatory pricing, *Water quality act, *Waste water treatment, *Income distribution, *Alternative costs, *Wisconsin, Water districts.
Identifiers: *Madison Metropolitan Sewerage District(Wis).

This study was undertaken to address the shortcomings associated with pricing and investment policies of public utilities. Prices are used primarily for financing purposes, rather than a tool for managing demand, and investment considerations do not appear to be predicated upon economic concepts. These practices may be a result of the utility's emphasis on noneconomic issues. The study objective was to make available a tool based upon the economic interactions of a system which will allow management to evaluate possible alternative management policies. Several models were developed. A theoretical model was developed from which the optimal pricing and investment conditions necessary for welfare maximization were derived. The optimal pricing scheme derived was marginal cost pricing. An applied profit oriented model was introduced, the declining-block rate model. In addition to satisfying the profit objective of private utilities this type of model was also used to demonstrate new objectives of municipally-owned utilities can be satisfied. An economic-simulation model was used to depict the Madison Metropolitan Sewerage District. Further, a conceptual model was first constructed and the empirical model was built to capture specific characteristics of the system. Two main objectives accomplished are: (1) the construction of an economic-simulation model to be used in the management decision making process; and (2) the demonstration that alternative management policies produce differences with respect to costs, revenue, demands, and incidence of financial burden.
W76-02864

COMPUTING THE BIG PICTURE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W76-02874

MINIMIZATION OF COMBINED SEWER OVERFLOWS BY LARGE-SCALE MATHEMATICAL PROGRAMMING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02878

GEOCHEMICAL IMPACT ON LEAD-MINING WASTEWATERS ON STREAMS IN SOUTHEASTERN MISSOURI,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 5C.
W76-02897

EVALUATION OF THE STRENGTH AND SEAKEEPING ABILITY OF POLLUTION CONTROL BARRIERS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. H. Milgram, and J. F. O'Dea.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-004 674, $7.25 in paper copy, $2.25 in microfiche. Report No CG-D-55-75, September 1974. 202 p, 9 fig, 1 tab, 17 ref, 4 append. DOT-CG-12937-A.

Descriptors: *Oil spills, *Barriers, *Model studies, *On-site investigations, Oceans, Laboratory tests, Waves(Water), Currents(Water), Structures, Structural stability, Structural behavior, Heaving, Strength, Movement, Water pollution control.
Identifiers: *Oil booms, *Oil spill cleanup, *Seakeeping.

The purpose of the work described is to provide a basis for the evaluation of arbitrary oil pollution control barriers without the need for full scale testing. For well-designed barriers the principal cause of oil leakage is droplet entrainment, which has little to do with the barrier, but depends on how the barrier is used. Since the leakage from droplet entrainment cannot be quantitatively predicted at this time (1974) and is only slightly dependent on barrier design, a barrier is best evaluated on its strength and seakeeping ability. A barrier is adequate for the task intended if it is strong enough and follows the seas well enough for it to provide a surface-piercing curtain with adequate draft and freeboard. The report gave means for making these evaluations. These were substantiated with full-scale, model and analytical results. (Humphreys-ISWS)
W76-02929

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE REAERATION OF UNIFORM STREAMS,
Mississippi Univ., University. Dept. of Civil Engineering.
C. V. Alonso, J. R. McHenry, and J-C. S. Hong.
Water Research, Vol 9, No 8, p 695-700, August 1975. 4 fig, 17 ref. OWRT A-062-MISS (3).

Descriptors: *Diffusivity, *Hydraulic properties, *Sediments, *Reaeration, *Suspended solids, *Subcritical flow, *Turbulent flow, Open channel flow, Uniform flow, Absorption, Dynamics, Froude number, Reynolds number, Sediment load, Velocity, Dissolved oxygen, Laboratory tests.

A laboratory flume was used to study the influence of suspended sediment on the surface reaeration of uniform streams. Reaeration constants were first determined in clear water flows and subsequently in flows carrying sediment in the form of a Florida quartz sand. All flows were subcritical and turbulent. The Froude number ranged from 0.85 to 0.33. The Reynolds number was greater than 33,000 in all experiments. Flow depths ranged from 0.03 to 0.107 m, and the average velocities from 0.287 to 0.875 m/s. The maximum depth-averaged sediment concentration attained was 3562 parts per million. Based on the premise that the reaeration coefficient is controlled by an effective vertical diffusivity at the free surface and by turbulent mixing beneath it, an equation was developed to predict the reaeration rate of uniform clear water flows. This equation was then modified to account for the effect of suspended sediments on the surface reaeration of uniform sediment-laden flows. The new equation indicated that the reaeration rate decreases as the average suspended sediment concentration increases. The decrease was attributed to the dynamic influence of suspended particles on the turbulent flow field. (Harmeson-ISWS)
W76-02934

LIMESTONE BARRIERS TO NEUTRALIZE ACIDIC STREAMS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
F. H. Pearson, and A. J. McDonnell.
Journal of the Environmental Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No EE3, Paper 11382, p 425-440, June 1975. 9 fig, 17 ref, 2 append. OWRT A-030-PA (4).

Descriptors: *Limestones, *Acid streams, *Neutralization, *Acid mine water, *Water pollution sources, Calcium carbonate, Carbonate rocks, Lime, Barriers, Limiting factors, Environmental effects, Ecology, Mine drainage, Water quality, Mathematical models, Model studies, Water analysis, Streams, Pollutants, Pollution abatement, Mine drainages, Coal mines, Mining, Water pollution.
Identifiers: *Limestone barriers, Crushed limestone, Rate limiting reactions.

Water samples were taken for analysis, and measurements were made to determine the effect of each installation on water quality at four prototype limestone barriers that had been constructed to neutralize acidic streams. The pH of stream water was increased by up to 3 pH units at low streamflow, to pH 7 or above. This demonstrates that limestone barriers are capable of renovating acidic streams to the point that normal aquatic life can be restored, rendering the stream water suitable for a number of uses that are otherwise precluded. A mathematical model of limestone barriers was constructed, based on hydraulic laws and on the chemical kinetics of the rate limiting reactions between crushed limestone and acidic water. Model predictions matched the observed performance of the barriers. A procedure was developed to determine the design of a barrier of crushed limestone to neutralize a given streamflow. (Henley-ISWS)

W76-02938

EVALUATION OF COPPER ACCUMULATION IN PART OF THE CALIFORNIA AQUEDUCT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-02957

ENVIRONMENTAL CONSIDERATIONS OF SANITARY LANDFILL SITES: PART TWO,
Dames and Moore, New York.
For primary bibliographic entry see Field 5E.
W76-02988

TALES OF AN OBLIGING LADY (SPECIAL REPORT OF SOLID WASTES: LEACHATE CONTROL).
For primary bibliographic entry see Field 5E.
W76-02989

WATER GATE,
For primary bibliographic entry see Field 8C.
W76-02995

OIL-SPILL DETECTION SYSTEM,
Texaco Inc., New York. (Assignee).
For primary bibliographic entry see Field 5A.
W76-02996

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMIZATION OF WATER ALLOCATION, WASTEWATER TREATMENT, AND REUSE CONSIDERING NON-LINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-02636

PLANNING AN INPUT-OUTPUT STUDY FOR WATER RESOURCES MANAGEMENT IN NEVADA,
Max C. Fleischmann Coll. of Agriculture, Reno, Agr. Div. of Agricultural and Resource Economics.
J. G. Detering, J. W. Lord, and W. C. Wilson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 133, $3.00 in paper copy, $2.25 in microfiche. Report No. MS 20, July 1970. 45 p, 1 fig, 2 tab, 30 ref. OWRT A-032-NEV(1).

Descriptors: *Water allocation(Policy), *Nevada, Input-output analysis, Industries, Decision making, Economic impact, Model studies, Regional economics, Regional analysis, Planning, Water utilization, Competing uses.
Identifiers: Economic sectors.

Allocation of water resources among alternative uses has been a major problem in orderly economic growth and development in Nevada. Major questions are: (1) What are the basic relationships of economic sectors and regions in terms of generating economic activity; (2) what direct and secondary effects does change or activity within economic sectors for each region have on production, employment, and income; (3) how does demand for goods and services in each economic sector affect water requirements in each region; and (4) how can limited water supplies be allocated between competing uses so as to stimulate economic growth. The Inter-industry Input-output model was chosen as a framework within which to analyze these problems and arrive at alternative solutions. In developing a suitable input-output matrix serious consideration should be given to developing the inter-industry accounts from secondary data (for the output structure and weighting coefficients) and the 370 sector national model (for estimating the input structure). There should be three regions, given the emphasis upon water allocation problems. Sector definition should be determined primarily by reference to specific problems and characteristics of the state's economy and resource bases. The model should include a wide range of economic management problems. (Auen-Wisconsin)
W76-02640

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-02714

SIMULATED BEEF FEEDLOT BEHAVIOR UNDER ALTERNATIVE WATER POLLUTION CONTROL RULES,
Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 5G.
W76-02720

MODELS IN WATER RESOURCES,
D. H. Marks.
Chapter 4 in 'A Guide to Models in Governmental Planning and Operations,' U.S. Government Printing Office, Washington, D.C., 1974, p 103-137 (prepared for Office of Research and Development, EPA, Washington, D.C.). 4 fig, 1 tab, 12 equ, 111 ref.

Descriptors: *Water resources development, *Decision making, *Mathematical models, *Water quality, *Water pollution control, *Water allocation(Policy), Management, Analytical techniques, Simulation analysis, Statistics, Input-output analysis, Optimization, Linear programming, Dynamic programming, Equations, Investment, Water utilization, River basins, Economics.
Identifiers: *Water quantity, Public sector, Multiple objectives, Nonlinear programming, Games, Integer programming, Geometric programming, Delaware Estuary, Rio Colorado(Argentina).

A comprehensive, detailed survey is made of modeling for decision making in water resources management. The discussion is categorized into water quality and water quantity, and a wide variety of model types and problems is considered. The chapter focuses on optimal resource allocation in public sector problems where, unlike the private sector, there is no complete pricing mechanism to guide the decision or express preferences. The section on water quality is mainly concerned with pollution--waste inputs to water which preclude or damage water utilization. Being searched for are potentially better uses for residuals and more effective development policies; important is the choice of when, where, how, and how much to invest in water quality. The section on water quantity considers the physical aspects of water and its allocation to proper use. The decision maker must design investments and strategies for obtaining and transporting water in reliable quantities. A problem is diverse interest groups with diverse preferences and objectives. Costs and benefits are not in commensurate units, and the decision maker must weigh and balance many factors. Among those areas of modeling considered herein are pollution impacts on water bodies and groundwater, urbanized storm runoff, treatment technology, economic and social impacts of water pollution control, optimal taxing, regional water supply analysis, reservoir management, and investment scheduling and sequencing. Modeling techniques include simulation and dynamic and linear programming. The Delaware Estuary and Rio Colorado (Argentina) are used for illustrations. (Bell-Cornell)
W76-02722

IMPROVED STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMAL RESERVOIR OPERATION BASED ON THE ASYMPTOTIC CONVERGENCE OF BENEFIT DIFFERENCES,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W76-02729

STREAMFLOW HYDROLOGY AND SIMULATION OF THE SALT RIVER BASIN IN CENTRAL ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W76-02731

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02875

DEVELOPMENT OF REGIONAL SUPPLY FUNCTIONS AND A LEAST-COST MODEL FOR ALLOCATING WATER RESOURCES IN UTAH: A PARAMETRIC LINEAR PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
A. B. King, J. C. Anderson, C. G. Clyde, and D. H. Hoggan.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 822, $6.75 in paper copy, $2.25 in microfiche. Supp. 2 to IWR Contract Report 74-4, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, June 1972. 162 p, 60 fig, 17 tab, 68 ref, 3 appen. OWRR B-027-UTAH(3).

Descriptors: *Water resources, *Planning, *Parametric hydrology, *Linear programming, *Water transfer, Cost-benefit analysis, *Utah, Great Salt Lake, Water allocation(Policy), Water costs, Hydrologic data, Inter-basin transfers, Mathematical models, Systems analysis, Alternative planning, Optimization, Reservoirs, Water supply.
Identifiers: Shadow price, Agricultural use, Municipal and industrial use, Supply functions.

This report develops supply functions for agricultural and municipal and industrial use in ten hydrologic study units in Utah using parametric linear programming. The shadow-price of imported water to each study unit was determined to show the possible economic consequence of interbasin transfer. In general, imported water is of little or no value if water presently being evaporated from Great Salt Lake is available for diversion upstream. A statewide linear programming allocation model was developed to meet projected requirements, subject to various hydrologic constraints and limits on diversions. The primary factor affecting interbasin transfer of Colorado River water is the degree to which evaporation occurs from Great Salt Lake. (Bell-Cornell)
W76-02876

MINIMIZATION OF COMBINED SEWER OVERFLOWS BY LARGE-SCALE MATHEMATICAL PROGRAMMING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02878

ASCE URBAN WATER RESOURCES RESEARCH PROGRAM,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Program.
For primary bibliographic entry see Field 2A.
W76-02939

ON THE VALUE OF INFORMATION TO FLOOD FREQUENCY ANALYSIS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-02952

6B. Evaluation Process

DEVELOPING A CORPORATE RESPONSE TO POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass. School of Business Administration.
For primary bibliographic entry see Field 5G.
W76-02613

COASE, SOCIAL COST AND STABILITY: AN INTEGRATIVE ESSAY,
California Univ., Los Angeles. Urban Planning Programs.
For primary bibliographic entry see Field 6C.
W76-02616

MANAGEMENT OF THE BIOLOGICAL RESOURCES OF THE LAKE ONTARIO BASIN,
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
D. M. Carlson.
Available from the National Technical Information Service Springfield Va 22161 as COM-74 10008, $9.25 in paper copy, $2.25 in microfiche. N. Y. State Sea Grant Program, Albany, Great Lakes Management Problems Series, August 1973. 281 p, 42 fig, 36 tab, 136 ref, 11 append.

Descriptors: *Lake Ontario, *Management, *Institutions, Great Lakes, Planning, United States, Canada, Watersheds(Basins), Recreation, Physical properties, Fish harvest, Land use, Human population, International commissions, Commercial fish, Sport fish, Stocking, Recreation facilities, Wildlife, Birds, New York.

A number of facets of the Lake Ontario basin are explored. The lake has the smallest surface and second smallest drainage basin, while having the greatest range of natural recreational resources of the Great Lakes. The glacial lake has an average depth of 91 m. It receives only 16% of its water budget from the Lake Ontario drainage basin. The shorelines are steep-sided clay banks with few sand beaches and frequent marshes and estuaries. The open waters of the lake show little impairment in water quality but significant changes are apparent in the tributaries and shoals. The major vegetation of the basin has been greatly altered exacerbating basin runoff and erosion. The report's remaining sections provide maps and statistics on the basin's fisheries, outdoor recreation, and wildlife. Commercial fishing in the basin has been limited, with the total 1971 Ontario and New York catch valued at only $516,000. Recreational use of the basin has been intense, and is expected to increase. Present deficiency in recreational management in the basin would be remedied through greater cooperative planning by affected governmental bodies. A number of cooperative arrangements within the basin are summarized. (Schroeder-Wisconsin)
W76-02617

USE OF WATER IN GEORGIA, 1970, WITH PROJECTIONS TO 1990,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
For primary bibliographic entry see Field 6D.
W76-02622

REGIONAL RESPONSE THROUGH PORT DEVELOPMENT: AN ECONOMIC CASE STUDY ON THE MCCLELLAN-KERR ARKANSAS RIVER PROJECT,
Arkansas Univ., Fayetteville. Bureau of Business and Economic Research.
P. H. Taylor, L. D. Belzung, and M. H. Sonstegaard.
Available from the National Technical Information Service, Springfield, Va 22161. Army Engineer Institute for Water Resources Report No IWR 74-5, August 1974. 154 p, 1 tab. DACW63-72-C-0145.

Descriptors: *Water resources development, *Economic impact, *Inland waterways, *Harbors, Industries, Regional development, Land development, Benefits, Competition, Barges, Port authorities, Comprehensive planning, Investment, Arkansas, Oklahoma.
Identifiers: *McClellan-Kerr Arkansas River Proj., Arkansas Verdigris Region, Industrial parks.

The construction of the McClellan-Kerr Arkansas River Waterway created a new resource that increased economic growth opportunities for the Arkansas-Verdigris Region and adjacent areas. This report docuements the port development response for this region. It contains a description of the present state of port and industrial park development along the Waterway, and, at the state and local level, the underlying conditions necessary for the creation of these facilities. Since the initiative for port development comes from state and local levels, the strategy and plans which evolve present important clues about potential economic impacts from the point of view of the region. The report surveys seven major port areas and thirteen individual ports. Data, in matrix form, is presented on the physical attributes of the ports, public and private investment and financing and management arrangements. It appears, that while the region may not be on the verge of surge of development, overall port development has been adequate in both location and capacity. However, the regional economic enhancement would have been greater if port planning had been started earlier, looked further ahead, and considered a wider range of alternatives. Furthermore, too much of the port and related industrial development have been delegated to local governments. (Carpenter-Wisconsin)
W76-02623

NATURAL DISASTERS: SOME EMPIRICAL AND ECONOMIC CONSIDERATIONS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 6C.
W76-02625

THE DELAWARE ESTUARY SYSTEM, ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC EFFECTS: ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W76-02626

SOCIAL EFFECTS OF CHANGES IN USES OF BEAR LAKE, AN INTERSTATE BODY OF WATER,
Utah State Univ., Logan. Inst. for Social Science Research.
W. H. Andrews, and W. C. Dunaway.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 069, $6.00 in paper copy, $2.25 in microfiche. Research Monograph No 5, November 1975. 119 p, 33 tab, 7 fig, 53 ref, 2 append. OWRT A-023-UTAH(1). 14-31-0001-5045.

Descriptors: *Social change, Recreation, Hydroelectric power, Idaho, Utah, *Social impact, *Multiple purpose reservoirs, *Water utilization, Interstate, Water pollution
Identifiers: *Bear Lake(Idaho-Utah).

Rapid growth of the Bear Lake area (located in Utah and Idaho) has resulted in many potential advantages and disadvantages. Economic growth, increased tax revenues, improved sewage and culinary services and more and better recreational facilities are several of the potential advantages resulting from the growth. Among the possible disadvantages are loss of fish and wildlife habitats, lessening of fthe aesthetic qualities of the area, threats to human safety through development in sensitive areas, degradation of air and water quality, shifts in the economic base and increased taxes. Different special interest groups were identified where values were found to be somewhat incompatible, thus providing for a source of conflict within this area. Differences in the opinions of local farmers, local non-farmers, and absentee property owners were discovered with respect to social values regarding development of the lake area. Alternatives to the present situation need to be developed in order to deal with the social, economic, and physical changes. Several of these alternatives are discussed in terms of their possible contributions to the resolution of the various problems.
W76-02634

PLANNING AN INPUT-OUTPUT STUDY FOR WATER RESOURCES MANAGEMENT IN NEVADA,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6A.
W76-02640

CONFERENCE ON THE MANAGEMENT OF RECREATIONAL LAKES.
Wisconsin Univ., Madison. Water Resources Center.
Available from the National Technical Information Service Springfield Va 22161 as PB-248 110, $5.50 in paper copy, $2.25 in microfiche. Held on May 17-18, 1972, Wisconsin University Center, Marinette County. 123 p. OWRT 3-046-WIS (10) and B-065-Wis (4).

Descriptors: *Management, *Recreation, *Lakes, *Wisconsin, Tourism, Economic impact, Eutrophication, Planning, Competing uses, Water quality, Land use, Land development, Organizations, Land management, Dredging, Harvesting.
Identifiers: *Lake rehabilitation, Lily Lake(Wis), Lake Noquebay(Wis), Marinette County(Wis).

Papers examining a number of recreational lake management problems were presented at a conference sponsored by the University of Wisconsin system and the Wisconsin Department of Natural Resources. Three basic problems were identified by the participants: threats to the water quality from sedimentation and over enrichment; deteriorated scenic qualities resulting from improper use and development; and increasing surface-water user conflicts as recreation demand increased. A number of physical solutions are discussed involving wastewater treatment or diversion, chemical treatment within the lake, harvesting, dilution, dredging, flushing, and bottom sealing. Managing the product of overfertilization is generally accomplished through treating excess plant growth by mechanical (harvesting), chemical (chemical application) and biologic (predation) means. New innovative institutional approaches involving individual, collective and governmental alternatives to protect and enhance recreational lakes are also discussed. Examples drawn from Wisconsin lakes' experiences are presented to illustrate a number of the physical and institutional solutions discussed. (See W76-02642 thru W76-02652) (Schroeder-Wisconsin)
W76-02641

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VATER-RELATED RECREATION: PLANNING OR MANAGEMENT,
ffice of Water Resources Research.
S. Gladwell.
n: Conference on the Management of Recreaonal Lakes, May 17-18, 1972, Wisconsin Univerty Center, Marinette County, p 5-24, 20 ref.

escriptors: *Recreation demand, Comprehensive planning, *Management, Social eeds, Competing uses, Sport fish, Projections, ublic rights, Jurisdiction, Legal aspects, Governent finance, Use rates, Riparion rights, emedies, Social aspects, Attitudes, Behavior, ost-benefit ratio. *Wisconsin.

ater quality, accessibility, and conflicts in use fluence the demand of water-related recreation. ecreation planners must understand the relation the hydrologic cycle to recreational water use, ographical distribution and availability of water sources, recreation desires of user groups, ological relationships between the water source and user, and economic factors. ciological aspects and the governmental role in anning, developing, and managing water bodies d correcting or adjusting existing conditions are scussed. Forecasts must be carefully prepared in der to incorporate future demands or conditions. ater quality surveillance must be continuous, tablished quality standards enforced, and deral grant programs for waste treatment facili s increased to maintain suitable water quality r recreation. Establishment of water quality teria for aquatic life is very complex. owledge about changes that have occurred ould help decide proper corrective measures, inease awareness of data limitations, and help plan ernatives. Economic evaluations aid in achievg optimal recreational water resources use. Outor recreation problems are related to urban oblems Lake development plans should consider an area proximity, probable nature and intensi of recreational use, recreational attributes of ecific lakes, and extent of governmental invement. Government plans must be goalented, environmentally sound, and publicly actable. (See also W76-02641) (Buchanan-David--Wisconsin)
6-02642

RECREATIONAL LAKES...WHAT ARE THE PROBLEMS,
isconsin Univ., Green Bay. Recreational ource Planning.
3. Ditton.
Conference on the Management of Recreaal Lakes, May 17-18, 1972, Wisconsin Univer Center, Marinette County, p 25-30.

criptors: *Competing uses, *Recreation deand, *Decision making, *Management, titudes, Water quality, Eutrophication, Bodies water, Tourism, *Wisconsin, Water users, So values, Lake shores, Aquatic weeds, Rightsway, Aesthetics, Public access, Regulation.
ntifiers: Recreation lake problems, Lake Nuebay(Wis), Lake rehabilitation, Shoreland elopment.

reation and tourism is the second largest indusin Wisconsin with water as the key element. o-economic determinants and extensive water urces in Wisconsin have caused a demandly conflict. Two categories of problems have recognized: physical lake problems and r surface use problems. Growth of nuisance ds and organisms due to increased sedimentaand nutrient input threaten aesthetic values, e health and safety problems, and affect fish ulations. Judgement of water quality by the ic, biologists, water chemists, or limnologists s. Water level manipulation and landfills also t recreational values of lakes. Conflicts in r surface use frequently occur between boat ng, water skiing, pleasure boating, and ming between water and shoreland uses. Surveys can help clarify water use problems. Studies of Lake Noquebay, Wisconsin, are discussed. In addition to zoning, the extent of public access is important in resolving water surface conflicts. Resolution of conflicts must be based on an equitable balance between the public's right to use water for recreation and the property owner. The public is uncertain as to which agency is responsible for solving these problems. Comprehensive watershed planning can optimize recreational lake values and can prevent many of these problems. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02643

A LAKE--HOW DOES IT BEHAVE,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-02644

UPGRADING LAKES--LAKE RENEWAL AND MANAGEMENT TECHNIQUES,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
For primary bibliographic entry see Field 5G.
W76-02645

UPGRADING LAKES--LAND-WATER RELATIONSHIPS,
Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
For primary bibliographic entry see Field 5G.
W76-02646

AQUATIC VEGETATION HARVESTING,
Dane County Dept. of Public Works, Madison, Wis.
For primary bibliographic entry see Field 4A.
W76-02647

ALTERNATIVES TO PROTECT AND ENHANCE LAKES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-02648

AN ENVIRONMENTAL LAND PLANNING APPROACH--CASE STUDY, LILY LAKE PROJECT,
Wisconsin Univ., Madison. Environmental Awareness Center.
M. A. Sharkawy.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 83-93.

Descriptors: *Comprehensive planning, *Land development, *Recreation, *Environment, Design, Social aspects, Psychological aspects, Sites, Political aspects, Geology, Administration, Topography, Management, Legal aspects, Climate, Landscaping, Architecture, Locating, Marketing, Engineering, Economics, *Wisconsin, Systems analysis, Lakes, Land management, Optimum development plans.
Identifiers: *Lily Lake Project(Wis), Case study, Green corridors, Cluster housing.

An environmental land planning process is illustrated utilizing the Lily Lake project. The project is part of a demonstration effort by the Upper Great Lakes Regional Commission to show alternative development plans and consists of a 3,600 acre tract including two lakes with natural shoreland and attractive meandering stretch of the Lily River. The planning approach detailed utilizes a multidisciplinary team to analyze both the cultural and natural milieus and their interrelationships. The team began by gathering market data on relevant demand and supply variables. Market segments and merchandising targets are also identified. Simultaneously, the process of inventory and site data collection is begun. Next, functional, and suitability, and ecological analyses are performed. The former analyzes the compatibility of various design elements (housing and recreation) with each other. The latter identifies and displays the physical elements, and the plant and wildlife ecology and their interrelationship for each site, and suggests the suitability of each for development. The final task under the planning process is to incorporate each of the analyses into an optimal general site plan utilizing a synthesis concept. Two syntheses approaches-- the cluster and green corridor concepts--are utilized in the planning model. The need for cash flow analysis within the planning process is also discussed. (See also W76-02641) (Schroeder-Wisconsin)
W76-02649

COOPERATION WITH THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Antigo, Wis. Resource Conservation and Development.
For primary bibliographic entry see Field 6E.
W76-02650

THE FACTS OF LIFE,
Wisconsin Univ. Center System-Marinette County, Bay Shore. Dept. of Economics.
J. E. Berry, and T. W. Thompson.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 101-108.

Descriptors: *Recreation, *Lakes, *Cost sharing, Lake shores, Dredging, Lake sediments, Costs, Biocontrol, Chemcontrol, Aquatic weed control, Harvesting, *Wisconsin, Land development, Cooperatives, Local governments, Economic impact.
Identifiers: *Lake Noquebay(Wis), *Lake rehabilitation, Marinette County(Wis), Lakeshore development.

The harmful effects of unplanned lakeshore development as it affects lakes and particularly Lake Noquebay, Marinette County, Wisconsin, are described. Filling and dredging low land created organic muck in which variable water milfoil thrives. Effectiveness, cost, target specificity, legal feasibility and political attractiveness, and side effects of four milfoil control alternatives are discussed. Biological control by carp such as the white amur, is deleterious to recreational fishing. Dredging is costly (approximately $1 million without disposal costs) and may cause high turbidity. Chemcontrol by herbicide applications would cost about $30,548 annually, but swimming and fishing might be halted for several days. The best method would be mechanical weed harvesting, costing about $22,190 annually plus equipment costs of $30-50,000. The lake is valued over $1 million per year to the local economy. Tourism generates $11.5 million a year in direct sales in Marinette County, with Lake Noquebay responsible for a large portion of these sales. Much of this income would be lost and recreational opportunities foregone if the lake's recreation potential is eliminated. Township governments and property owners' associations must assume their share of financial responsibility before requesting additional funding. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02651

LAKES AND WISCONSIN'S FUTURE,
Wisconsin Office of the Governor, Madison. Lieutenent Governor.
For primary bibliographic entry see Field 6E.
W76-02652

LEGAL-POLITICAL HISTORY OF WATER RESOURCE DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN,
California Univ., Santa Barbara. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W76-02669

EVALUATING COSTS FOR PORT DISTRIBUTION SYSTEMS,
Board of Engineers for Rivers and Harbors, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-02716

ANALYSIS AND MANAGEMENT OF WATER DISTRIBUTION SYSTEMS,
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 4A.
W76-02718

MULTIOBJECTIVE PLANNING OF WATER AND LAND RESOURCES,
H. A. Steele.
In 'Economics and Decision Making for Environmental Quality,' (Ch 5), J. R. Conner and E. Loehman, Eds., Gainesville University Press of Florida, 1974, p 99-122, 1 fig, 4 tab, 33 ref.

Descriptors: *Water resources, *Planning, *Water policy, Economics, Standards, Land resources, Alternative planning, Decision making, U. S. Water Resources Council, Multiple projects.
Identifiers: *Multiple objectives.

Described are efforts by governmental agencies to develop new standards for planning for water and land resource development. Considered are former planning procudures, new directions in planning, special task force recommendations, planning of objectives--including national economic development, environmental quality enhancement, social well-being, and regional development--, benefits and costs, systems of accounts, and cost allocation and reimbursement. Discussed are the principles and standards developed by the Water Resources Council and how these principles evolved. A widespread problem has been that not enough information was reported on alternative plans for resource development to provide information on the trade-offs between monetary and nonmonetary values. The Council now recommends that several alternative plans be formulated and the differences among alternative plans illustrated in an account sheet format. A recommended plan can then be chosen on an evaluation of trade-offs. The Council has recognized that evaluation requires a broader judgmental basis and more public participation. (Bell-Cornel)
W76-02721

MODELS IN WATER RESOURCES,
For primary bibliographic entry see Field 6A.
W76-02722

STATE WATER PLANNING,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E.
W76-02735

THE ARIZONA RESOURCES INFORMATION SYSTEM - 1975,
Arizona Resources Information System, Phoenix.
Dept of Revenue
C C Winikka
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 5-11, 2 fig

Descriptors: *Arizona, *Natural resources, *Information retrieval, *Remote sensing, *Research and development, Data processing, Land use, Water utilization, Land classification.
Identifiers: Arizona Resources Information System.

The Arizona Resources Information System is designed to serve on going needs of the people of Arizona through state, federal and local agencies. The various land and water environmental organizations use the resource system for their research. The ARIS has prepared Arizona orthopotoquads, developed early land use classification systems, and evaluated electronic data processing graphical and analytical systems and many information systems. (McLachlan-Arizona)
W76-02736

FORMULATION OF NONSTRUCTURAL FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W76-02879

RESERVOIR PROJECT ENVIRONMENTAL STUDY,
Iowa State Water Resources Research Inst., Ames.
M. D. Dougal, and K. L. Dueker.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 101, No HY9, Proceedings paper No 11578, p 1257-1272, September 1975. 3 fig, 2 tab, 10 ref.

Descriptors: *Water resources development, *Reservoirs, *Environmental engineering, *Projects, Planning, River basins, Hydraulics, Methodology, Management, Decision making, *Iowa.
Identifiers: *Ames reservoir project(Iowa).

The research-management principles and methods used in conducting an interdisciplinary environmental resources study are summarized as an aid in complying with the federal NEPA requirements. A case study of the proposed Ames reservoir project in Iowa is used to illustrate the application of study methods, organization of the project study and review, cross-discipline coordination, problems encountered in achieving results, and application of these results in final decision making. Results achieved by the five study categories also are presented. The five functional categories include: (1) reservoir site and stream system as resource entities; (2) social and economic impact of the reservoir; (3) recreation and related open-space uses and needs; (4) physical relationship with the agricultural sector of the environment; and (5) physical relationships with the urban sector of the environment. For example, a principal element of Category number 1, the reservoir site study, was the description and evaluation of intrinsic properties. A computer-designed landscape overview model was adapted from previous work at Harvard University; this impact analysis permitted identification, storage and correlation of detailed natural resource information on a grid basis. Keys to good management are adequate project leadership, a well defined scope of work, adequate data and resource information, functional study categories as manageable tasks, ability to meet time schedules, anf formulation and publication of results. The Ames Reservoir Environmental Study illustrates how an environmental study can be formulated, staffed, and conducted. (Bell-Cornell)
W76-02880

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COASE, SOCIAL COST AND STABILITY: AN INTEGRATIVE ESSAY,
California Univ., Los Angeles. Urban Planning Programs.
J. Weld.
Natural Resources Journal, Vol 13, No 4, p 595-613, 1973. 2 fig, 14 ref.

Descriptors: *Resource allocation, *Econometrics, *Usufructuary right, Environment, Pollutants, Welfare(Economics), Trespass, Legal aspects.
Identifiers: *Nuisance externalities, *Property rights, *Coase theorem.

The economic value of normative legal judgements, especially those permitting dynamic stability of socio-econimic behavior has been a neglected issue in the evolving debate over the Coase theorem. Under the Coase theorem, Z conclusions are drawn. First, assuming the costless operational assumptions of perfect competition, positive economics would be indifferent as to the liability rule. Second, invoking the principle of Occam's razor, the simpler system of market solutions is preferrable to the complex systems of courts. But the latter conclusion precludes considerations of the dynamic properties of the two liability rules. The legal process invokes a number of stabilizing effects. The resulting social stability implies as normatives legal policies which transcent the operation of time and history, pluralistic policies which protect individual and neighborhood property interests from avoidable distrubance and a revealed set of societal interests which reference definition of private and social cost. A comparison indicates that, assuming both rules yield identical allocations, a legal solution appears more dynamically efficient. One additional question is addressed: How does legal and economic power, and the choice of the social starting point affect the dynamics of resource allocation, wealth distribution, locational clustering and socio-economic behavior. (Schroeder-Wisconsin)
W76-02616

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: PETROLEUM REFINING INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W76-02618

ECONOMIC DISINCENTIVES FOR POLLUTION CONTROL: LEGAL, POLITICAL, AND ADMINISTRATIVE DIMENSIONS,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02619

CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL,
Frumkin (Norman), Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02620

NATURAL DISASTERS: SOME EMPIRICAL AND ECONOMIC CONSIDERATIONS,
National Bureau of Standards, Washington, D.C.
G. T. Sav.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11719, $4.50 in paper copy, $2.25 in microfiche. Report No NBSIR 74-473, February 1974. 72 p, 20 fig, 23 tab, 23 ref, 1 append.

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escriptors: *Acts of God, *Economic impact, Protection, *Cost-benefit analysis, Floods, arthquakes, Tornadoes, Tropical cyclones, Decion making, Economic feasibility, Building odes, Warning systems, Optimization, Disasters.

he costs incurred in excess of $1 million, casuales, and psychological effects, from hurricanes, oods, earthquakes and tordadoes are examined ith the view of determining the optimal levels of rotection by applying benefit-cost analysis. Proerty damages resulting from hurricanes were 950-1954 $802 million, 1955-1959 $539 millior 960-1964 $1576 million and 1965-1969 $3091 million. Flood damages were: $1680 million, $1695 illion, $1151 million, and $2520 million, respecvely. Comparative figures are also given for rthquakes and tornadoes. Floods caused the eatest amount of total damage and more total roperty damages than the other three disasters. hen the primary concern in disaster protection is reduce the dollar value of property damages and e destruction of dwellings, then initial efforts ight be directed toward mitigating the effects of rricanes and floods. If the concern is for reducg the loss of lives, then it may be more effective invest in techniques for the mitigation of losses e to tornadoes. The conclusions, however, are sed only on assessment of the potential benefits eduction in losses) that might be realized by proting against adverse effects of disasters, with examination of the costs of protection. (Auenisconsin)
76-02625

CONOMICS OF SOIL TREATMENTS IN THE PPER COLORADO,
ah State Univ., Logan. Dept. of Range Science.
r primary bibliographic entry see Field 4D.
76-02674

ALUATING COSTS FOR PORT DISTRIBUON SYSTEMS,
ard of Engineers for Rivers and Harbors, shington, D.C.
r primary bibliographic entry see Field 4A.
6-02716

GHWAY AND SEWER IMPACTS ON URBAN VELOPMENT,
vironmental Impact Center, Inc., Newton, ss.
primary bibliographic entry see Field 5C.
6-02717

ALYSIS AND MANAGEMENT OF WATER TRIBUTION SYSTEMS,
ional Inst. of Scientific Research, Quebec.
primary bibliographic entry see Field 4A.
5-02718

ONDARY IMPACTS OF TRANSPORTAN AND WASTEWATER INVESTMENTS: SEARCH RESULTS,
ironmental Impact Center, Inc., Newton, s.
primary bibliographic entry see Field 5C.
-02757

GEN PULP BLEACHING CUTS WASTE LUENTS,
mer, Inc., Glens Falls, N.Y.
primary bibliographic entry see Field 5D.
-02805

CONOMIC EVALUATION OF ALTERNAE SEWERAGE PRICING AND INVESTT PRACTICES: THE MADISON ROPOLITAN SEWERAGE DISTRICT,
onsin Univ., Madison. Dept. of Agricultural omics.
primary bibliographic entry see Field 5G.

W76-02864

DEVELOPMENT OF REGIONAL SUPPLY FUNCTIONS AND A LEAST-COST MODEL FOR ALLOCATING WATER RESOURCES IN UTAH: A PARAMETRIC LINEAR PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W76-02876

6D. Water Demand

ENERGY DEMAND AND ITS EFFECT ON THE ENVIRONMENT,
Rand Corp., Santa Monica, Calif.
D. N. Morris.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 123, $4.00 in paper copy, $2.25 in microfiche. Rand Paper 5048, July 1973. 28 p, 13 fig.

Descriptors: *Energy, *Demand, *California, *Environmental effects, *Conservation, Fossil fuels, Air pollution, Electric power production, Land use, Water resources, Thermal pollution, Nuclear powerplants, Hazards, Projections, Radioactive waste disposal, Solar radiation, Insulation.
Identifiers: Commercial electricity usage, Residential electricity usage, Industrial electricity usage.

Two broad solutions to meeting the increased, and increasing, demands for energy are considered in the light of their environmental impacts in California. (1) Developing new supplies of energy fast enough to meet demands aggravates environmental pollution as present anti-pollution technology is inadequate and costly. Supplies of fossil fuels are finite and growth in conventional electricity production will have an adverse effect on rivers and coastlines. Expansion of nuclear energy incurs both short and long-term risks. (2) Ways of slowing increases in demand for energy so that supply can adequately meet it are considered: the use of natural gas an alternative to electricity; conservation methods--through consumer education, financial incentives and disincentives, and restrictive policies; and alternative sources energy--specifically solar. The economic and social implications of conservation and alternative energy sources are discussed. (Carpenter-Wisconsin)
W76-02621

USE OF WATER IN GEORGIA, 1970, WITH PROJECTIONS TO 1990,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
R. F. Carter, and A. M. F. Johnson.
Hydrologic Report 2, 1974. 80 p, 9 fig, 7 tab, 23 ref.

Descriptors: *Water utilization, *Georgia, *Projections, Water demand, Consumptive use, Estimating, Forecasting. Industrial water, Domestic water, Irrigation water.

Water use in Georgia during 1970 averaged about 5560 mgd for public supply--domestic, commercial, and industrial; rural domestic, livestock, and irrigation; self-supplied industrial, and thermoelectric power. Hydroelectric power used about 52,000 mgd. Consumptive use of water in 1970 averaged 318 mgd. Thermoelectric power plants used 3940 mgd, the most rapidly increasing water use in terms of actual amount used and in percent of increase. Projections of water use for 1990 indicate increases of 100% for public water supply systems, 18% for all rural uses, and 75% for self-supplied industries. Use of cooling water at thermoelectric powerplants is not projected to increase because of expected differences in the mode of operation at new plants. Water used by hydroelectric plants is expected to increase by 100% but much of this increase will result from water reuse through pumped-storage operation. Projections for 1990 total 6565 mgd, based on a 120% increase for irrigation and livestock and self-supplied industrial use of about 175% of 1970 consumption. No increase is expected in cooling water use by thermoelectric plants; water used by hydroelectric plants will only double, due to use of recirculated water. The consumptive use of water projections to 1990 will total 760 mgd. (Auen-Wisconsin)
W76-02622

REGIONAL RESPONSE THROUGH PORT DEVELOPMENT: AN ECONOMIC CASE STUDY ON THE MCCLELLAN-KERR ARKANSAS RIVER PROJECT,
Arkansas Univ., Fayetteville. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W76-02623

OPTIMIZATION OF WATER ALLOCATION, WASTEWATER TREATMENT, AND REUSE CONSIDERING NON-LINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-02636

PLANNING AN INPUT-OUTPUT STUDY FOR WATER RESOURCES MANAGEMENT IN NEVADA,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6A.
W76-02640

WATER-RELATED RECREATION: PLANNING FOR MANAGEMENT,
Office of Water Resources Research.
For primary bibliographic entry see Field 6B.
W76-02642

RECREATIONAL LAKES...WHAT ARE THE PROBLEMS,
Wisconsin Univ., Green Bay. Recreational Resource Planning.
For primary bibliographic entry see Field 6B.
W76-02643

6E. Water Law and Institutions

MANAGEMENT OF THE BIOLOGICAL RESOURCES OF THE LAKE ONTARIO BASIN,
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W76-02617

ECONOMIC DISINCENTIVES FOR POLLUTION CONTROL: LEGAL, POLITICAL, AND ADMINISTRATIVE DIMENSIONS,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02619

CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL,
Frumkin (Norman), Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02620

SOME INSTITUTIONAL CONSTRAINTS TO COASTAL ZONE MANAGEMENT: A CASE STUDY OF HAWAII,
Hawaii Univ., Honolulu. Coll. of Tropical Agriculture.
C. Gopalakrishnan, and J. Rutka.
American Journal of Economics and Sociology, Vol 33, No 3, p 225-232, 1974. 1 tab, 8 ref. NOAA SG 235243.

Descriptors: *Institutional constraints, *Public rights, *Hawaii, *Seashores, Management, Beaches, Jurisdiction, Zoning.

The problems hampering Hawaii's coastal zone management are primarily the result of some rather unique institutional structures, such as (1) the oligopolistic nature of shoreline ownership; (2) conflicts and controversies among shoreline interests, such as private owners, the environmental and conservation groups, and government agencies; (3) jurisdictional overlapping and lack of interagency coordination; and (4) absence of effective institutional mechanisms to ascertain public interest and incorporate public benefits into coastal zone legislation. Nearly 67% of the total shoreline and 77% of the sandy shoreline is owned between the military and private owners, resulting in an effective shoreline for public use of roughly 16%. Viable mechanisms to articulate and incorporate public interest have been all but absent but there are indications that the public is at long last making a concerted effort to reassert itself. Despite their overriding importance, institutional factors have received scant attention in formulating the state's coastal zone policy. The need for drastically revamping Hawaii's archaic infrastraucture to delineate a sound and efficient coastal zone management strategy is apparent. (Auen-Wisconsin)
W76-02624

SOCIAL EFFECTS OF CHANGES IN USES OF BEAR LAKE, AN INTERSTATE BODY OF WATER,
Utah State Univ., Logan. Inst. for Social Science Research.
For primary bibliographic entry see Field 6B.
W76-02634

COOPERATION WITH THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Antigo, Wis. Resource Conservation and Development.
R. Stats.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 94-100, 6 fig.

Descriptors: *Governmental interrelations, *Land development, Soil surveys, Topography, Watersheds(Basins), Drainage, Alternative planning, Land use, Limiting factors, Soil-water movement, *Wisconsin, Percolating water, Cooperation.
Identifiers: *Lake Noquebay(Wis), *Soil Conservation Service, Marinette County(Wis).

The Soil Conservation Service working through Soil and Water Conservation Districts provides basic soil and water information through planning and application assistance to individuals, groups, and governmental units. The Service supplies basic soil inventories, soil survey maps are checked, some topographical and on-site engineering studies may be made, and the watershed and possibly the surrounding land and drainage area studied. The owners' needs, desires, and goals are then analyzed; possible alternatives are provided for a given situation; then decisions made and recorded. Soil surveys provide background information for determining best land-use patterns and to help develop plans. The Soil Conservation Service discusses limitations for soil uses such as housing, roads, trees, crops, sewage systems, foundations, and erosion potentials, but does not say that a particular soil can or cannot be used for a specific use. A 7700 acre area near Lake Noquebay was mapped; soil survey photographs were prepared showing soil types and slopes, and limitations on soil use were described. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02650

LAKES AND WISCONSIN'S FUTURE,
Wisconsin Office of the Governor, Madison. Lieutenent Governor.
M. Schreiber.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 109-112.

Descriptors: *Legislation, *Lakes, *Wisconsin, *State governments, Political constraints, Air pollution, Water pollution control, Water resources, Institutions, Legal aspects, Pollution abatement, Monitoring, Effluents, Water quality control.

The efforts of the Wisconsin State Legislature to abate, control, and eliminate water pollution are emphasized by the Lieutenant Governor. A measure was enacted to limit mercury discharges. A bill transfering the pesticide review board from the Department of Agriculture to the Department of Natural Resources (DNR) and change its function to a chemical substances review board was not considered by the Senate. A 1971-3 executive budget provision requires industrial polluters to submit pollution reports to the DNR and to pay monitoring fees based on quantity and quality of effluent discharged. Funds were provided for the DNR Environmental Protection Division to establish water and air quality monitoring stations and make un-announced on-site inspection of pollution sources. The DNR considers environmental quality when issuing permits to alter waterways or construct dams; environmental impact reports on effects on water quality can be required. The Wisconsin Environmental Policy Act requires environmental impact evaluation of major actions or legislation by state and local governments. Bills prohibiting untreated domestic sewage discharge into waters, declaring all pollution a public nuisance, permitting anyone to prosecute without having to prove specific damages, limiting use of phosphates and harmful detergent chemicals, and placing deposits on non-returnable bottles were not passed. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02652

LEGAL-POLITICAL HISTORY OF WATER RESOURCE DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN,
California Univ., Santa Barbara. Dept. of Political Science.
D. E. Mann, G. D. Weatherford, and P. Nichols.
Lake Powell Research Project Bullentin No 4, September, 1974. 53 p, 1 fig, 2 tab, 106 ref.

Descriptors: *Colorado River Basin, *Colorado River, *Water law, *Water resources development, *Planning, Colorado River Compact, Mexican Water Treaty, Legal aspects, Water rights, Legislation, Water policy, Water quality, Governments, Conservation, Water management(Applied).
Identifiers: *Colorado River Storage Project Act.

The first part of this study is a descriptive summary of the legal history surrounding passage of the Colorado River Storage Project Act of 1956, while the second part approaches those historical events analytically from the perspective of political science. The major political and legal decisions emanating from the Colorado River Compact of 1922 and resulting in the 1956 Act are identified. Five general themes are evident in history: (1) the developmental needs of the Upper Basin, (2) the legal constraints of the 1922 Compact, (3) the economic wisdom of the Colorado River Storage Project, (4) the conservation value of Dinosaur National Momument, and (5) the engineering feasibility and geologic effects of the project. The dynamics of the political bargaining, including the nature of some of the major tradeoffs are described. The persistence of distributive politics, in the face of increasing pressure for a more regulatory mode of decision-making, is discussed in the context of some of the current problems such as water quality of the river. Finally, several unresolved issues of public policy concerning Colorado River management are posed. (Robinett-Arizona)
W76-02669

MULTIOBJECTIVE PLANNING OF WATER AND LAND RESOURCES,
For primary bibliographic entry see Field 6B.
W76-02721

STATE WATER PLANNING,
Arizona Water Commission, Phoenix.
W. E. Steiner.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 1-4.

Descriptors: *Water resources, *Arizona, *Water policy, *Planning, *Water management(Applied), Desalination, State governments, Water importing, Water distribution(Applied), Legislation, Weather modification, Colorado River.
Identifiers: *Central Arizona Project.

From the establishment of the Arizona Resources Board in 1928 until the Arizona Water Commission was formed in 1971, no state water plan was developed. Since 1971, the longest and most intensive planning studies have been concerned with allocation of Colorado River water through the Central Arizona Project. Future plans involve desalting sea water, weather modification, importation of water, etc. The Arizona State Water Plan ultimately will be a plan of management of Arizona's limited water resources. Water plans and economic and environmental impact evaluations are scheduled for completion by July, 1977. (McLachlan-Arizona)
W76-02735

6F. Nonstructural Alternatives

UPGRADING LAKES--LAKE RENEWAL AND MANAGEMENT TECHNIQUES,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
For primary bibliographic entry see Field 5G.
W76-02645

UPGRADING LAKES--LAND-WATER RELATIONSHIPS,
Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
For primary bibliographic entry see Field 5G.
W76-02646

FORMULATION OF NONSTRUCTURAL FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James.
Water Resources Bulletin, American Water Resources Association, Vol 11, No 4, p 688-705, August 1975. 1 fig, 23 tab, 3 ref.

Descriptors: *Flood control, *Non-structural alternatives, Evaluation, Assessment, Flood plains, Decision making, Community development, Costs, Benefits, Surveys, Planning, Management.

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A balanced flood program combines structural measures to contain flood waters with nonstructural means of limiting flood plain development and increasing flood proofing of flood plain buildings. The design of nonstructural measures requires determination of which aspects of a local situation can cause a particular program to function or fail. Lists are provided of four physical factors, six community factors, and eight individual factors that have been found to be most influential in determining whether a given means can be implemented in a given setting and whether, if it were, the desired responses would be induced. The applicability of the physical, community, and individual factors to assessing the effectiveness of an implementation means is evaluated. For example, the community factor of widespread recognition of the flood problem' by community residents is believed to be a determining influence in how effective the community will be in distributing flood warnings (one of the ten implementation means) in ways to which people will respond. Results of a case study in which the physical, community, and economic factors were evaluated for the flood plains of three small creeks in metropolitan Atlanta are given. Individual flood plain occupants have a major role in making the land use and building decisions that constitute nonstructural measures. (Bell-Cornell)
W76-02879

G. Ecologic Impact Of Water Development

NGINEERING DESIGN HANDBOOK, ENRONMENTAL SERIES, PART ONE, BASIC NVIRONMENTAL CONCEPTS.
my Materiel Command, Alexandria, Va.
vailable from the National Technical Information Service, Springfield, Va 22161 as AD-784 999, 75 in paper copy, $2.25 in microfiche. AMC mphlet No. 706-115, July 31, 1974 (Supersedes MCP 706-115, October 1969). 225 p, 56 fig, 48 , 165 ref.

scriptors: *Publications, *Environment, ilitary aspects, *Engineering, Topography, Climates, Climatology, Arid climates, Humid climates, Wet climates, Glaciers, Ice, Snow, cipitation(Atmospheric), Environmental effects, Biology, Microorganisms, Vegetation, Erosion, Corrosion, Corrosion control, Rots, Decomsing organic matter, Air pollution, Solar radiation, Testing, Model studies, Materials.
ntifiers: *Macrobiological organisms, Pests.

s handbook, a revision of an earlier document, he first in a series on the nature and effects of ironmental phenomena. Part One introduced importance of the environment; i.e., its effts, the factors of the environment, the complex nbinations of the environment that occur, quantive environmental concepts, and the testing of eriel and simulation of the environment. The egorization of materiel as it exists and relates to ironmental effects also was discussed. Inluced in a general and qualitative manner were e factors that are to be treated quantitatively he succeeding volumes. The revision augted the treatment of those factors and cies, a combination of factors discussed only fly in the original handbook. The chapter on eriel categorization was added. Chapter dings are: (1) The Environment Faced By The tary, (2) Importance of Environment, (3) ural Environmental Factors, (4) Induced Enmental Factors, (5) Combined Environmental ors-Climates, (6) Quantitative Environmental cepts, (7) Testing And Simulation, and (8) eriel Categorization. (Humphreys-ISWS)
-02550

MULATION MODEL FOR STUDYING EFTS OF POLLUTION AND FRESHWATER INFLOW ON SECONDARY PRODUCTIVITY IN A ECOSYSTEM,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 5C.
W76-02567

ENERGY DEMAND AND ITS EFFECT ON THE ENVIRONMENT,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 6D.
W76-02621

THE DELAWARE ESTUARY SYSTEM, ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC EFFECTS: ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W76-02626

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 4C.
W76-02865

RESERVOIR PROJECT ENVIRONMENTAL STUDY,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 6B.
W76-02880

MODELS AND THE DECISION MAKING PROCESS: THE HUDSON RIVER POWER PLANT CASE,
Brookhaven National Lab., Upton, N.Y. Dept. of Biology.
C. A. S. Hall.
Available from the National Technical Information Service, Springfield, Va 22161, as BNL-19203, $4.00 in paper copy, $2.25 in microfiche. Report No BNL 19203, (1974). 19 p, 4 fig.

Descriptors: *Powerplants, *Estuaries, *Fisheries, *Hudson River, Striped bass, Life history studies, Trash racks, Entrainment, Cooling water, Mortality, *Model studies, Cooling towers, Decision making, Estuaries, *New York.
Identifiers: Consolidated Edison.

Directly or under contract with Consolidated Edison data was collected and modeled to determine the effects of power plants on the Hudson River estuarine environment, with particular emphasis on striped bass. The life cycle of the fish is described. Power plants were found to have a substantail effect on fish mortality, particularly by impingement on trash screens and by entrainment during cooling water uptake. Based on the model results, the Atomic Energy Commission has required that all future Hudson River plants under their jurisdiction would have to be equipped with wet cooling towers and that cooling towers would have to be backfilled on existing plants. The problems of subjectivity, objectivity, and bias of modelers as they relate to decision making are discussed, particularly in view of the fact that social and policy aspects were not included in the models; no evaluation was made of the benefits and losses of fisheries as opposed to more electricity. However, the fish issue gave a lever to conservationists during hearings as the more vague issues of fuel depletion, regional air pollution, and additional industrial expansion made possible by the availability of electricity are less easily argued. (Auen-Wisconsin)
W76-02987

7. RESOURCES DATA

7A. Network Design

NUMERICAL ERRORS IN WATER PROFILE COMPUTATION,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-02688

STUDY OF TIME-LAPSE PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 4A.
W76-02713

THE ARIZONA RESOURCES INFORMATION SYSTEM - 1975,
Arizona Resources Information System, Phoenix. Dept. of Revenue.
For primary bibliographic entry see Field 6B.
W76-02736

7B. Data Acquisition

A REVIEW OF THE POTENTIAL APPLICATIONS OF REMOTE SENSING TECHNIQUES TO HYDROGEOLOGICAL STUDIES IN AUSTRALIA,
Newcastle Univ. (Australia). Dept. of Physics.
C. D. Ellyett, and D. A. Pratt.
Australian Water Resources Council, (Camberra), Technical Paper No 13, 1975. 147 p, 55 fig, 3 tab, 72 ref, append.

Descriptors: *Remote sensing, *Hydrogeology, *Australia, *Reviews, Infrared radiation, Radar, Aircraft, Electromagnetic waves, Radiation, Electronic equipment, Soil moisture, Groundwater, Geology.
Identifiers: Side looking airborne radar, Low frequency electromagnetic methods.

This review examined the relationship between remote sensing measurements and the physical properties of hydrogeological environments. Research into the hydrogeological applications of many of these remote sensing methods is still in its infancy and virtually no method can currently be considered a proven tool for hydrogeological investigations, as distinct from surface water studies. The visible and thermal infrared methods in combination will provide a powerful tool for the study of near surface soil moisture over large areas. The thermal infrared method has been successfully applied to the detection of groundwater discharge into bodies of open water, and in certain circumstances can be used to estimate the discharge rate. Some physical property information relevant to hydrogeological environments can be obtained from side looking airborne radar (SLAR) surveys, although the cost of such surveys would usually be considered prohibitive. Recent advances with a monopulse radar system have shown considerable promise for the detection of shallow groundwater tables and the estimation of soil moisture content. The low frequency electromagnetic methods provide greater ground penetration than radar systems and are suitable for the investigation of near surface aquifers and recharge zones. The aeromagnetic method may be used indirectly in certain circumstances for the study of hydrogeological environments. (Sims-ISWS)
W76-02534

MEASUREMENT AND ANALYSIS OF TEMPORAL VARIATIONS OF SALINITY IN SHALLOW WATER,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.

W76-02542

EVALUATION OF AN INFRARED OIL FILM MONITOR,
Wright and Wright, Inc., Newton Center, Mass.
For primary bibliographic entry see Field 5A.
W76-02544

THE DESIGN AND PERFORMANCE OF A 6-CUP ANEMOMETER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Mechanical Engineering.
D. Lindley.
Journal of Applied Meteorology, Vol 14, No 6, p 1135-1145, September 1975. 11 fig, 1 tab, 25 ref.

Descriptors: *Anemometers, *Winds, *Instrumentation, Velocity, Measurement, Testing, Evaluation, Equipment, Design criteria, Engineering, Meteorology.
Identifiers: Wind tunnel tests.

An investigation was made into the design and performance of 'staggered' 6-cup anemometers. It was found that the optimum cup arm radius to cup radius ratio (R/r) for both these and 3-cup anemometers is indeterminate; the value to be used in any design only depends on the speed of cup rotation required for a given wind speed. The calibrations for such instruments were linear at all settings of R/r. Distance constants as low as 0.5 m were obtained at an optimum setting of cup wheel spacing to cup radius (L/r) of 2.5 for wheels of all polystyrene construction. Tests of 6-cup, 3-cup, and propeller anemometers in a sinusoidally fluctuating air stream demonstrated that the percentage overestimation of the mean wind speed varied from 3% (for the Gill 4-blade propeller) to 11.5% for the 3-cup (lipless) anemometer of all polystyrene construction at a gust amplitude of 0.5. The 6-cup anemometer had a marked superiority in these tests over the 3-cup anemometers and also had lower starting speeds. (Sims-ISWS)
W76-02553

IMPROVEMENTS IN PHENOLDISULFONIC ACID METHOD FOR DETERMINATION OF NOX,
Pratt and Whitney Aircraft, East Hartford, Conn.
For primary bibliographic entry see Field 5A.
W76-02557

OSCILLATOR CIRCUIT FOR PROVIDING A CONDUCTIVITY RATIO OF SEA WATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
L. C. Murdock.
U.S. Patent No 3,906,353, 6 p, 11 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1371, September 16, 1975.

Descriptors: *Patents, *Salinity, *Water properties, *Conductivity, *Electrical conductance, Electrical equipment.
Identifiers: Oscillators, Electrical circuits.

An instrument is described which utilizes two conductivity cells, one conductivity cell being adapted for measuring the conductivity of the water environment acting on the cell, and a second cell which is a standard cell for measuring the conductivity of a standard sample of water of known salinity. The ratio of the conductivity measurements of the two cells is by international agreement an indication of salinity. An output signal is obtained which is proportional to the conductivity ratio and this output signal must be conveyed to a remote location such as by a wire link communication. The oscillator of the invention includes a first circuit which provides a first output signal indicative of a desired measured parameter. This measured parameter is conductivity ratio. A second circuit arrangement provides a second output signal which varies linearly with time. An output amplifier which includes first and second inputs receives the respective first and second output signals and is operable to provide an output signal whose value switches between relatively positive and negative output values as determined by its input signals. The output signal from the amplifier has a period or frequency which is directly proportional to the measured parameter and independent of power supply voltage. The output signal from the amplifier is fed back to serve as the input signals to the first and second circuits. (Sinha-OEIS)
W76-02594

A DIGITIZED RADAR FOR PRECIPITATION MEASUREMENTS AND APPLICATIONS TO HYDROLOGY,
Kansas State Univ., Manhattan. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2B.
W76-02635

AN IMPROVED RECORDING GAGE FOR BLOWING SNOW,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Watershed Lab.
R. L. Jairell.
Water Resources Research, Vol 11, No 5, p 674-680, October 1975. 8 fig, 5 ref.

Descriptors: *Snow, *Precipitation gages, Design data, Air, Winds, Snow cover, Installation, Flow control, Instrumentation.
Identifiers: *Recording gage, *Blowing snow, Snow trap, Particle counters, Snow fence, Belfort weighing gage, Air sample.

Experience gained from an earlier gage (Tabler and Jairell, 1971) led to significant innovations that have greatly improved the operation of a simple, inexpensive instrument for recording blowing snow. The most important improvement was the efficient turntable design which allowed the precipitation gage to be independent of the snow trap, the result having been a high-quality chart record. Principal advantages included simplicity, inexpensiveness, and suitability for operation in remote areas that lack electrical power. The relationship of the snow caught by this gage to snow accumulation behind a snow fence should be studied further as a means of calibration. It appeared that the gage could be used to estimate total snow transport during drifting events. (Roberts-ISWS)
W76-02700

MEASUREMENT OF INTERNAL WAVES OF TIDAL FREQUENCY NEAR A CONTINENTAL BOUNDARY,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environment Lab.
For primary bibliographic entry see Field 2L.
W76-02710

DEVELOPMENT AND TESTING OF A LASER RAIN GAGE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2B.
W76-02752

ASSESSING SOIL MOISTURE REMOTELY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-02753

ASSESSING BARE SOIL EVAPORATION VIA SURFACE TEMPERATURE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2D.
W76-02754

MEASURING SNOW COVER FROM ERTS IMAGERY ON THE BLACK RIVER BASIN,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2C.
W76-02756

WATER SAMPLING DEVICE.
For primary bibliographic entry see Field 5A.
W76-02818

WATER QUALITY MEASURING APPARATUS.
For primary bibliographic entry see Field 5A.
W76-02826

LIQUID POLLUTION MEASUREMENT.
For primary bibliographic entry see Field 5A.
W76-02857

A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH RESOURCES TECHNOLOGY SATELLITES, TWENTY-FOUR MONTH PROGRESS REPORT.
Minnesota Univ., Minneapolis. Space Sciences Center.
For primary bibliographic entry see Field 4A.
W76-02901

FOREST DISEASE DETECTION AND CONTROL,
Minnesota Univ., St. Paul. Dept. of Plant Pathology.
For primary bibliographic entry see Field 2I.
W76-02902

EVAULATION OF WATER QUALITY BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., St. Paul. Dept. of Forest Biology.
For primary bibliographic entry see Field 5A.
W76-02903

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 4A.
W76-02904

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-02905

USE OF ERTS IMAGERY TO ASSIST IN SNOWMELT FLOOD PREDICTION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 2C.
W76-02906

REMOTE SENSING APPLICATIONS TO HYDROLOGY IN MINNESOTA,
Minnesota Univ., Minneapolis, Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-02907

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W76-02908

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GEOPHYSICAL STUDIES OF FLOATING ICE BY REMOTE SENSING,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2C.
W76-02954

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2J.
W76-02963

SOIL MOSITURE DETECTION DEVICE,
For primary bibliographic entry see Field 2G.
W76-02997

7C. Evaluation, Processing and Publication

BACKGROUND INFORMATION FOR PROPOSED NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS, PETROLEUM REFINERIES, STORAGE VESSELS, SECONDARY LEAD SMELTERS AND REFINERIES, BRASS OR BRONZE INGOT PRODUCTION PLANTS, IRON AND STEEL PLANTS, SEWAGE TREATMENT PLANTS: VOLUME 2, APPENDIX: SUMMARIES OF TEST DATA.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs; and Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
For primary bibliographic entry see Field 5G.
W76-02543

USE OF WATER IN GEORGIA, 1970, WITH PROJECTIONS TO 1990,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
For primary bibliographic entry see Field 6D.
W76-02622

LOWER SHEYENNE RIVER BASIN WATER - LAND - PEOPLE.
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 5A.
W76-02627

PHYSICAL FRAMEWORK OF GROUND WATER OCCURRENCE AND MOVEMENT IN GLACIAL DEPOSITS IN CENTRAL NORTH DAKOTA,
North Dakota Univ., Grant Forks. Dept. of Geology.
H. Ulmer, and D. K. Sackreiter.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 074, $3.50 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report, No WI-221-74, December 1974, 1 map. (N. D. Geological Survey Report of Investigation 51). OWRT A-037-NDAK(1). 14-31-0001-3834.

Descriptors: *Groundwater movement, *Glacial sediments, *North Dakota, Stratigraphy, Glaciation, Cenozoic era, Pleistocene epoch.
Identifiers: Cenozoic stratigraphy(ND), Charging Eagle Formation(ND), Medicine Hill Formation(ND), Horseshoe Valley Formation(ND), Pleistocene glacial sediment, Snow School Formation(ND), Oahe Formation(ND).

The late Cenozoic stratigraphy of central North Dakota is best exposed along the nearly continuous, 20-meter-high, vertical bluffs of Lake Sakakawea in the Missouri River trench. The following lithostratigraphic units (in ascending order) can be correlated for many tens of kilometers along the bluffs: (1) Charging Eagle Formation (late Tertiary or early Pleistocene sediment of a northeast-flowing ancestor of the Missouri River); (2) lower Medicine Hill Formation (Pleistocene sediment of northeast-flowing ancestor of the Missouri River and of meltwater streams and lakes); (3) upper Medicine Hill Formation (Pleistocene glacial sediment); (4) lower Horseshoe Valley Formation (Pleistocene sediment of northeast-flowing ancestor of the Missouri River and of melt-water streams and lakes); (5) upper Horseshoe Valley Formation (Pleistocene glacial sediment); (6) lower Snow School Formation (Pleistocene sediment of a northeast-flowing ancestor of the Missouri River and of melt-water streams and lakes); (7) middle Snow School Formation (Pleistocene glacial sediment); (8) upper Snow School Formation (late Pleistocene sediment of a glacier that advanced tens of kilometers southwest of the present position of the Missouri River); and, (9) Oahe Formation, with four members recognizable throughout the area (late Wisconsinan and Holocene wind-blown silt; characteristics of members are controlled by changes in hillslope stability resulting from climatic changes). These stratigraphic units provide the physical framework for groundwater movement in much of central North Dakota.
W76-02631

GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 2. AN EVALUATION OF THERMAL WATER IN THE BRUNEAU-GRAND VIEW AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4B.
W76-02655

WATER RESOURCES DATA FOR NEBRASKA, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lincoln, Nebr.
R. A. Engberg, and L. R. Petri.
Data Report, 1975. 252 p, 1 fig, 4 tab, 20 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Nebraska, Basic data collections, Chemical analysis, Physical properties, Streamflow, Sediment transport, Water temperature, Biological properties, Sampling, Sites.

Water-resources data for the 1974 water year for Nebraska include records of data for the chemical and physical characteristics of surface and groundwater. Data on the quality or surface water (chemical, biological, temperature, and sediment) were collected from designated sampling sites once daily, weekly, monthly, or less frequently. Records of chemical analyses are given for 175 groundwater sites. Locations of the surface water sampling stations are shown on a map. (Woodard-USGS)
W76-02656

ANALYSIS OF THREE YEARS OF COMPLETE-FIELD TEMPERATURE DATA FROM DIFFERENT SITES OF HEATED SURFACE DISCHARGES INTO LAKE MICHIGAN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-02683

RESULTS OF SEA SURFACE MAPPING IN THE PERU UPWELLING SYSTEM,
San Francisco State Univ., Calif. School of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-02698

COMPUTER SIMULATION OF THE SNOWMELT AND SOIL THERMAL REGIME AT BARROW, ALASKA,
Michigan Univ., Ann Arbor. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W76-02703

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-02714

AN ANALYSIS OF BORDER IRRIGATION FLOW,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 3F.
W76-02728

IMPROVED STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMAL RESERVOIR OPERATION BASED ON THE ASYMPTOTIC CONVERGENCE OF BENEFIT DIFFERENCES,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W76-02729

AERIAL SNOWPACK MAPPING,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 2C.
W76-02755

DEVELOPMENT OF REGIONAL SUPPLY FUNCTIONS AND A LEAST-COST MODEL FOR ALLOCATING WATER RESOURCES IN UTAH: A PARAMETRIC LINEAR PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W76-02876

MINIMIZATION OF COMBINED SEWER OVERFLOWS BY LARGE-SCALE MATHEMATICAL PROGRAMMING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02878

SELECTION OF THRESHOLD VALUES IN GEOCHEMICAL DATA USING PROBABILITY GRAPHS,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2K.
W76-02892

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 4A.
W76-02904

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-02905

A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-02928

REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHLY MEAN SUBTRACTION,
Purdue Univ., Lafayette, Ind. Schools of Engineering.
For primary bibliographic entry see Field 2A.
W76-02944

WATER RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA, 1974-75,
Geological Survey, Las Vegas, Nev.
For primary bibliographic entry see Field 4B.
W76-02958

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
J. C. Fisher, and H. D. King, Jr.
Open-file report, September 1975. 264 p, 19 fig, 15 tab, 4 ref.

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Surface waters, *Streamflow, *Texas, Basic data collections, Hydrologic data, Storm runoff, Hydrographs, Mass curves, Reservoirs.
Identifiers: *Houston area(Tex), Reservoir content.

This report contains rainfall and runoff data collected during the 1973 water year for drainage basins in the Houston, Texas metropolitan area. The information will be useful in determining the extent to which progressive urbanization will affect the yield and mode of occurrence of storm runoff. Detailed rainfall-runoff computations, including hydrographs and mass curves, are presented for nine storm periods during the 1973 water year. The most significant storm event of the year occured in June. Widespread showers of moderate to low intensities fell June 5-10. On June 11, 12, and 13 widespread, moderate to high intensity rains fell on the entire study area. A three day total rainfall average of 10 inches (254 mm), together with high antecedent soil moisture and moderate to high rainfall intensities, produced high rainfall-runoff ratios. Runoff data are based on discharge measurements and stage records at 14 continuous-record stream-gaging stations, 7 partial-record stream-gaging stations, and 2 reservoir-content stations. (Woodard-USGS)
W76-02961

DOCUMENTATION OF FINITE-DIFFERENCE MODEL FOR SIMULATION OF THREE-DIMENSIONAL GROUND-WATER FLOW,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-02962

GROUND-WATER LEVELS IN WYOMING, 1974,
Geological Survey, Lakewood, Colo.
W. C. Ballance, and P. B. Freudenthal.
Open-file report (basic-data report), August 1975. 186 p, 21 fig, 3 ref.

Descriptors: *Groundwater resources, *Basic data collections, *Water wells, *Water level fluctuations, *Wyoming, Well data, Hydrography, Observation wells, Pumping, Irrigation, Networks.

Groundwater levels are measured periodically throughout Wyoming in an observation-well network by the U. S. Geological Survey in cooperation with the Wyoming State Engineer and the city of Cheyenne. Water-level measurements provide information on the status of the groundwater supply and facilitate prediction of trends in water levels, which indicate change in groundwater storage. During 1974, about 1,500 measurements were made. Net water-level changes were computed, using about 235 measurements made during the first 4 months of 1974 and 1975. Tables of well history, highest and lowest water levels, net changes, and hydrographs for most wells are included in this report. (Woodard-USGS)
W76-02964

SOME LIMNOLOGICAL ASPECTS OF 20 SELECTED LAKES IN EAGAN AND APPLE VALLEY, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 2H.
W76-02966

8. ENGINEERING WORKS

8A. Structures

SMALL-CRAFT HARBORS: DESIGN, CONSTRUCTION, AND OPERATION,
Moffatt and Nichol, Long Beach, Calif.
J. W. Dunham, and A. A. Finn.
Available from the National Technical Information Service, Springfield, Va. 22161. United States Army Coastal Engineering Research Center Report SR-2, December 1974. 375 p, 175 fig, 5 tab, 37 ref, 11 append. DACW 72-72-C-0011.

Descriptors: *Harbors, *Marinas, *Recreation facilities, Jetties, Breakwaters, Port authorities, Coastal structures, Shore protection, Docks, Piers, Piles(Foundations), Engineering structures, Environmental effects, Planning, Operation and maintenance.
Identifiers: *Harbor facilities, Fueling systems, Drydocks.

Analytical data and design standards and procedures were presented for use in the development of small-craft harbors and launching facilities under a wide variety of conditions applicable to a broad spectrum of geographic locations. Environmental impact and governmental control aspects were discussed. Procedures for determining project feasibility and possible sources of governmental assistance were presented. Harbor operations and administration were reviewed. Several case histories of harbors were included. (Sims-ISWS)
W76-02548

FREEZEUP PROCESSES ON ARCTIC BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W76-02551

DESIGN AND CONSTRUCTION OF HYDRAULIC STRUCTURES ON PERMAFROST,
A. I. Gromov.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A003 317, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 416, September 1974. 15 p, 5 fig. Translated from Trudy Lengidroproyekta. Vesesoyuznyy Proyektno-Izyskat' el'skiy i Nauchno-Issledovatel'kyiy Institut, No 8, p 165-175, 1968.

Descriptors: *Cold weather construction, *Dams, *Powerplants, *Hydroloelectric plants, *Permafrost, *Hydraulic structures, Cold regions, Polar regions, Construction, Concrete construction, Concrete dams, Rockfill dams, Winter.
Identifiers: *Mamakanskaya hydroelectric plant(USSR). *USSR.

The construction standards currently available for planning and production of hydraulic structures on permafrost were explored briefly. The diversity of natural conditions and the poor state of study of their features requires a fairly careful approach to a determination of the possibility of employing permafrost soils as a foundation for structure with reference to the pressures and nature of structures. It is necessary to formulate specific technical conditions for the planning of each building project in the Far North due to the incompleteness of present observations. Several possible conditions affecting the building of hydraulic structures were dealt with. The construction of the Mamakanskaya Hydroelectric plant proved the effectiveness, economy, and engineering feasability of utilizing precaste ferroconcrete under the conditions of a harsh climate. (Sims-ISWS)
W76-02913

8B. Hydraulics

FILLING AND EMPTYING SYSTEM FOR ICE HARBOR LOCK, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
L. Z. Perkins.
Available from the National Technical Information Service, Springfield Va 22161 as ADA-000 312, $5.00 in paper copy, $2.25 in microfiche. Technical Report No 32-1, May 1973. 82 p, 11 fig, 22 plates, 19 tab, 1 ref.

Descriptors: *Locks, *Model studies, *Hydraulic models, Hydraulics, Hydraulic structures, Engineering structures, Dams, Navigation, Valves, Flow control, Laboratory tests, Culverts, Structures, Hydraulic engineering, Washington.
Identifiers: *Ice Harbon Dam(Wash), *Snake River(Wash), Filling and emptying systems.

The Ice Harbor lock, 86 ft wide by 675 ft long, has a split-lateral hydraulic system and a maximum lift of 103 ft. The hydraulic system, lock chamber, outlet basin, and portions of approach channels were reproduced in a 1:25-scale model. Design details of the lateral culverts were studied in a 1:16-scale model. Pressures downstream from the right filling valve and in 90-degree bends of the original emptying culverts were lower and hawser forces on barge tows were higher than desired. Pressures in the right culvert were increased by moving the roof transition upstream to the filling valve. Pressures in the 90-degree bends were satisfactory when expanding sections just upstream from the outlet basin were eliminated and the outlet basin was changed to direct flow downstream. Hawser forces were reduced by redesigning the upstream sill block. The adopted lock chamber and filling system were tested for lifts between 80 and 112 ft. Filling times were 10.2, 11.4, and 11.7 min for lifts of 80, 103, and 112 ft, respectively. Corresponding emptying times were 12.9, 14.1, and 14.7 min. Overall lock coefficients were 0.84 (filling) and 0.60 (emptying). Typical maximum hawser forces during the above lifts were 2.3, 3.6, and 4.4 tons; transverse forces were under 2.5 tons. Seventeen-ft-wide roofs on the lateral culverts did not reduce large random hawser forces. The possibility of vortex action over the intake manifolds was slight when the intake ports were 10 ft upstream from the upper sill block and almost none when the distance was increased to 31.08 ft. (final design). (Sims-ISWS)
W76-02536

SCOUR AT BRIDGE WATERWAYS--A REVIEW,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
A. G. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 685, $4.00 in paper copy, $2.25 in microfiche. Report for Federal Highway Administration, Washington, D.C., October 1974. 29 p, 6 fig, 11 ref. FHWA P.O. 4-1-0159.

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Descriptors: *Scour, *Bridges, *Piers, *Dimensional analysis, *Erosion, Laboratory tests, Shear.
Identifiers: *Field data, *Transport rate.

A brief investigation is described of scour around bridg piers with emphasis on the following areas: (1) analysis of various formulations for scour around bridge piers, (2) ongoing Federal Highway Administration field studies of scour around bridge piers, and (3) recommendations for future research. It was pointed out that practically all of the presently available scour formulas can be reduced to a common set of dimensionless parameters. When compared the formulas differed widely in form and magnitude. There is a serious lack of data to cover a wider range of parameters in order to discover trends. It was recommended that these gaps be filled by research and that other areas relative to bridge openings be examined in order to clarigy the areas in which more study, both laboratory and field, is needed. (Bhowmik-ISWS)
W76-02684

HORIZONTAL SPREAD OF WASTEWATER FIELD OVER CALM OCEAN SURFACE,
Montgomery Inc., Pasadena, Calif. M. James.
For primary bibliographic entry see Field 5B.
W76-02687

NUMERICAL ERRORS IN WATER PROFILE COMPUTATION,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
E. McBean, and F. Perkins.
Journal of Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY11, Proceedings Paper 11694, p 1389-1403, November 1975. 4 fig, 4 tab, 6 ref, 2 append.

Descriptors: *Flow profiles, *Gradually varied flow, Computer programs, Hydraulics, Numerical analysis, Open channels, Open channel flow.
Identifiers: *Water profiles, *Numerical errors, *Numerical integration, Open channel hydraulics.

The numerically-generated errors created during water surface profile computation were examined. Theoretical equations were developed to serve as bounds on the actual errors that are introduced during the computation. The analysis also provided criteria which may be used in the rational selection of the calculation increment. Experimental results demonstrated that in most engineering application the effect of numerical errors on the computed profile will be considerably smaller than that due to data uncertainty. There are cases, however, when numerical error generation is significant, but these appear to be predictable through the error bound equations. (Lee-ISWS)
W76-02688

THE APPLICATION OF STEP-DRAWDOWN PUMPING TESTS FOR DETERMINING WELL LOSSES IN CONSOLIDATED ROCK AQUIFERS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W76-02747

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02875

RECIPIENT MOTION AND SEDIMENT TRANSPORT,
Illinois State Water Survey, Urbana; and Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 2J.
W76-02877

VELOCITY--BED-FORM--TEXTURE PATTERNS OF MEANDER BENDS IN THE LOWER WABASH RIVER OF ILLINOIS AND INDIANA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-02919

HIERARCHICAL ATTRIBUTES AND A UNIFYING MODEL OF BED FORMS COMPOSED OF COHESIONLESS MATERIAL AND PRODUCED BY SHEARING FLOW,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-02920

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE REAERATION OF UNIFORM STREAMS,
Mississippi Univ., University. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-02934

TRANSIENT FLOW ROUTING IN CHANNEL NETWORKS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
E. F. Wood, B. M. Harley, and F. E. Perkins.
Water Resources Research, Vol. 11, No 3, p 423-430, June 1975. 14 fig, 2 tab, 6 ref. OWRT C-1708(3159)(2) and (C-3301)(3716) and C-1495(1988)(3).

Descriptors: *Simulation analysis, *Mathematical models, *Unsteady flow, *Networks, Hydraulic models, Channels, Hydraulics, Routing, Rivers, Flow.
Identifiers: *Finite difference, *James River(Va), *Cork Harbor(Ireland), *Bayamon River(Puerto Rico), Matrices.

The formulation of a mathematical model to predict transient flows in hydraulic networks was presented. The network formulation consisted of breaking the network up into a series of connected reaches; reducing the finite difference equations for each reach into two 'reach' equations; forming an exterior matrix consisting of the reach equations, external boundary conditions, and interior compatibility conditions; solving the external matrix for the end values of discharge and water surface elevation for all reaches; and back-substituting for all interior values. Examples presented include the James River estuary model (24 nodes and 26 reaches), the Cork Harbor, Ireland, estuary (13-reach double-looped network), and a Rio Bayamon basin, Puerto Rico. Results were very satisfactory when they were compared to known data. The structure of the network made it possible to incorporate special features such as bridges, dams, and locks into the simulation analysis. (Lardner-ISWS)
W76-02941

DEMONSTRATION OF A METHODOLOGY FOR DREDGED MATERIAL RECLAMATION AND DRAINAGE,
Dames and Moore, San Francisco, Calif.
For primary bibliographic entry see Field 5E.
W76-02945

INVESTIGATION OF MATHEMATICAL MODELS FOR THE PHYSICAL FATE PREDICTION OF DREDGED MATERIAL,
Army Engineer Waterwasys Experiment Station, Vicksburg, Miss. Office of Dredged Material Research.
For primary bibliographic entry see Field 5B.
W76-02946

PREDICTED EFFECTS OF PUMPING ON LOWERING THE WATER TABLE IN THE TWIN, CRYSTAL, RYAN LAKES-HIGHWAY 100 AREA, HENNEPIN COUNTRY, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4C.
W76-02965

8C. Hydraulic Machinery

FILLING AND EMPTYING SYSTEM FOR ICE HARBOR LOCK, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-02536

METHOD AND APPARATUS FOR CONTROLLING WATER FLOW FROM AN IMPOUNDED BODY OF WATER,
Fluid Dynamics Proprietory Ltd., Cape Town (South Africa).
For primary bibliographic entry see Field 4A.
W76-02595

CISTERN.
Australian Patent 444,625, Applied March 11, 1970, Issued January 31, 1974. Official Journal of Patents, Trade Marks, and Designs, Vol 44, No 3, p 259, January 31, 1974.

Descriptors: *Patents, *Cisterns, *Design data, Weir, Valves, Floats, Operation, Conduits, Waste water treatment.

A cistern is described which has walls and a base forming a container, a weir, or a dividing wall, joining walls at its ends and extending upwardly from the base to divide the cistern into two parts. There is a ball valve part and a float part which connect above the weir. The upper edge of the weir or dividing wall is below the upper edges of the walls. A pair of float operated valves are carried by the cistern and positioned above the ball valve part of connected to mains supply. An outlet conduit extends downwardly from the first pair of valves and passes through the cistern base. A by pass tube places the conduit in fluid flow connection near the base with the float part of the cistern and constitutes an ejector inlet conduit. A short outlet conduits depending from the second pair of valves, each valve has a valve operating arm pivoted to it with floats attached to it. The floats are positioned in the float part of the cistern. (Merritt-FIRL)
W76-02821

WATER GATE,
R. L. Halpern, and C. L. Skiles.
U.S. Patent No. 3,916,628, 3 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 80, November 4, 1975.

Descriptors: *Patents, *Water levels, *Water level fluctuations, *Water pollution control, Engineering structures, *Gates, Bodies of water.
Identifiers: *Floating gates.

To permit a pollution-free connection of a polluted with an unpolluted body of water or an estuary or streams, a pair of gates which, except for a limited time interval, confine the pollutants to the polluted body of water and prevent their dissemination to or intrusion into connected bodies of water which would otherwise be pollution free. A floating gate in its closed position has its ends placed in recesses on each side of the water way. The gate has a controlling device to slide one-half of it into an open position. The gate is maintained in a level position during its traverse from closed to open position. The gate has compartments which can be

filled with fluid to maintain it in a flotation position relative to the surface of the water in the waterway. The gate is free to rise and fall as the level of water changes. (Sinha-OEIS)
W76-02995

PROPELLING PIPE SUPPORT TOWER FOR PIVOT IRRIGATION SYSTEMS,
For primary bibliographic entry see Field 3F.
W76-02999

8D. Soil Mechanics

STABILIZATION OF SOIL AND AGGREGATE MATERIALS FOR FORWARD AREA OPERATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
R. W. Grau.
Available from the National Technical Information Service, Springfield, Va 22161. AD-A001 521 $4.50 in paper copy, $2.25 in microfiche. Instruction Report S-74-3, September 1974. 51 p, 16 fig, 3 tab, 4 ref.

Descriptors: *Soil stabilization, *Soil physical properties, *Military aspects, Soil aggregates, Soil compaction, Surface sealing, Soil types, Soil stability, Soil strength, Soil structure, Soil sealants, Waterproofing, Roads, Airports, Mechanical properties, Construction, Soil mechanics.

The purpose of this instruction report was to provide information for the use of native soil and aggregate materials for the expedient construction of roads, airfields, heliports, and storage areas in forward areas of a theater of operations. Procedures were presented to aid the military engineer in evaluation or identification of the soil and in selecting methods of improving the existing physical properties of the native materials so that they will be suitable for construction purposes. Also, the procedures would help the engineer select the type and quantity of additive required if chemical stabilization is to be used. The methods considered in this report for improving the physical properties of low-quality materials were mechanical and chemical stabilization and waterproofing techniques. Information was also given to help in the selection of the appropriate construction equipment for a particular operation. Detailed construction procedures were outlined for the various types of stabilization. (Sims-ISWS)
W76-02681

FILTRATION OF DRAINAGE ELEMENT,
For primary bibliographic entry see Field 4A.
W76-02838

OPTIMAL HEIGHT OF A DAM FOR PRESERVATION OF BEARING GROUND IN A FROZEN STATE,
Yu. G. Kulikov.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A003 318, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 451, January 1975. 6 p, 3 fig. Translated from Transportnoye Stroitel'stvo, No. 10, p 35-37, October 1968.

Descriptors: *Earth dams, *Frozen ground, *Thawing, Permafrost, Cold weather construction, Cold regions, Dams, Beds, Dam foundations, Frozen soils, Vegetation, Solar radiation, Albedo, Evaporation, Heat transfer, Model studies, Mathematical models.
Identifiers: *USSR.

In the construction of an earth bed in regions where permafrost ground occurs, instances of the thawing of the frozen base are found under the fills of slight height as a result of changes in the heat exchange condition (distruptions of vegetative cover, conditions of evaporation, insolation, condensation, albedo of surface) and also as a result of the effect exerted by the surface and groundwater. Under such conditions, for finding the amount of settling of the fills during the planning of an earth bed, it is necessary to calculate the thawing depth of the permafrost base or even to determine the height to fill at which the permafrost ground does not thaw. The thawing depth of a frozen base under a fill made of thawed ground is greater than under a fill formed of frozen ground. (Sims-ISWS)
W76-02910

FREEZING OF AN EARTH DAM FROM THE DRY SLOPE SIDE,
A. A. Tsvid.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 216, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 430, December 1974. 19 p, 9 fig, 1 tab, 6 ref. Translated from Dal'nevostochnyy Nauchno-Issledo-vatel'skiy Institut po Stroitel'stuv, Sbornik Nauchnykh Rabot, Vol I, p 94-104, 1961.

Descriptors: *Earth dams, *Permafrost, *Freezing, Frozen ground, Cold weather construction, Cold regions, Dams, Dam construction, Temperature, Insulation, Thermal insulation, Ventilation.
Identifiers: *USSR, Freezing rates.

The article discussed measures for increasing an earth dam's freezing rate by natural cold through the dry-slope side both during pouring the fill and during operation of the frozen dam. Among these measures were included: (1) removal of snow from the dam surface; (2) covering the surface of the dry slope with insulation during summer; (3) installation of a permanent screen over the dam; and (4) freezing of ice reserves on the dry slope's surface, with tunnels ventilated in winter. (Sims-ISWS)
W76-02914

VARIATION OF GEOCRYOLOGICAL CONDITIONS BENEATH DAMS DEPENDING ON UPPER TEMPERATURE LIMITS,
S. A. Zamolotchikova.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 209, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 457, February 1975. 15 p, 3 fig, 1 tab, 15 ref. Translated from Merzlotnyze Issledovaniyi, No 8, p 186-198, 1968.

Descriptors: *Embankments, *Permafrost, *Cold weather construction, Highways, Railroads, Roadbanks, Cold regions, Excavation, Earthworks, Construction, Road construction, Earth dams, Soil mechanics, Thawing, Freezing, Cryology.
Identifiers: *USSR.

In the northern regions of the USSR, construction of railroads and highways is expanding on a broad front. In the building of roads, a grouping of structures is being developed, among which the earth bed (fills, excavations, etc.) is one of the main items. A compilation of forecasts indicating the variation in permafrost ground under fills and in excavations has rarely been made by calculation until now, because in each case, it is necessary to solve a two- or three-dimensional problem regarding the freeze-thaw cycles in soils. A prediction of the variation in permafrost conditions beneath fills can now be formulated based on the results of interdisciplinary permafrost surveying. This report discussed one of the first attempts at analyzing the influence of cutoff temperatures on the variation in permafrost ground under a fill. (Sims-ISWS)
W76-02915

BUILDING DAMS IN PERMAFROST REGIONS,
N. G. Semenov.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 319, $3.25 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 452, November 1974. 5 p, 3 fig, 3 ref. Translated from Gidrotekhnicheskoye Stroitel'stvo, No 9, p 14-15, 1967

Descriptors: *Earth dams, *Permafrost, *Freezing, Cold weather construction, Cold regions, Dams, Frozen ground, Construction, Dam construction, Seepage, Civil engineering, Structures.
Identifiers: *USSR.

By observations, the possibility has been confirmed of erecting dams in permafrost regions on loose soils containing much ice. It was shown that the complete freezing of a dam's body with the aid of blowing cold air through the dam (according to a special system built into the dam) occurs quite intensively. The procedures involved in planning and building the dam in a permafrost region were detailed. (Sims-ISWS)
W76-02925

8E. Rock Mechanics and Geology

DESIGN AND CONSTRUCTION OF HYDRAULIC STRUCTURES ON PERMAFROST,
For primary bibliographic entry see Field 8A.
W76-02913

8F. Concrete

SURVEY OF CORROSION OF PRESTRESSING STEEL IN CONCRETE WATER-RETAINING STRUCTURES,
For primary bibliographic entry see Field 8G.
W76-02535

CONCRETE FOR TUNNEL LINERS: BEHAVIOR OF STEEL FIBER REINFORCED CONCRETE UNDER COMBINED LOADS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
K. S. Herring, and C. E. Kesler.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 382, $5.00 in paper copy, $2.25 in microfiche. Report UILU-ENG-74-2025, August 1974. 71 p, 23 fig, 9 tab, 10 ref. DOT FR 30022.

Descriptors: *Reinforced concrete, *Tunnel linings, *Mechanical properties, Reinforcement, Laboratory tests, Compressive strength, Poisson ratio, Elasticity(Mechanical), Failure(Mechanics), Stress, Materials testing, Strength of materials, Cements, Concretes, Engineering structures, Linings.
Identifiers: *Steel fiber reinforcement, Quick setting cements.

The study was undertaken to determine the behavior of a steel fiber reinforced concrete member subjected to combined compressive and flexural loads. In addition, information was obtained on the tensile stress-strain relationship, the modulus of elasticity in compression, and Poisson's ratio. Interaction diagrams were presented for concretes made with two quick setting cements and fiber contents of 0.9, 1.2, and 1.5% by volume. Compressive failures, tensile failure, and simultaneous compressive-tensile failures were obtained depending on the moment to axial load ratio. A method was presented for determining the tensile stress-strain relationship for a length of beam immediately surrounding a crack. This tensile stress-strain relationship makes possible a computerized post-crack analysis of fiber reinforced concrete structures. Fiber content, fiber orientation, and type of cement appear to have little affect on Poisson's ratio but do influence the

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nodulus of elasticity and the strength. (Sims-SWS)
W76-02545

8G. Materials

URVEY OF CORROSION OF PRESTRESSING TEEL IN CONCRETE WATER-RETAINING TRUCTURES,
. Phillips.
ustralian Water Resources Council, (Camberra), echnical Paper No 9, 1975. 143 p, 9 fig, 10 tab, 4 lates, 214 ref, 4 append.

escriptors: *Prestressed concrete, *Concrete ipes, *Water tanks, *Corrosion, *Australia, oncretes, Concrete structures, Concrete testing, routing, Reinforcement, Concrete technology, ailures, Cracks, Rupturing, Engineering, Sur-eys, Reviews.
lentifiers: *Concrete tanks, Steel wires.

he objectives of the survey were to: (1) identify e nature and mechanism of corrosion in restressing wire in concrete water-retaining ructures, and (2) assess the performance of ructures in Australia with respect to corrosion, d compare failures reported abroad with those perienced in Australia. Information on Aus-alian problems was obtained by discussions with gineers and through a questionnaire sent to all rties who were likely to be interested in the sub-ct. Information on overseas failures was ob-ined by a literature survey and by attending the ederation Internationale de la Precontrainte IP) Symposiums on Stress Corrosion in Arn-m, Holland. Authorities on the subject were nsulted on the way to and from Arnhem. In mpiling this report, an attempt was made to col-ct and summarize all the available information corrosion problems in prestressed water-retain-structures. Only the corrosion aspects were esented, but where information on repair ocedure was available, it was included. A brief view of corrosion problems experienced in estressed concrete structures other than reser-irs and pipes was also included. The report also d short sections on corrosion tests to determine susceptibility of a steel to stress corrosion acking or hydrogen embrittlement, on cathodic otection, other forms of protection, and surface tential measurements. The number of reported lures abroad is small compared to the total mber of prestressed concrete units in use. Of er 83 wire-wrapped tanks constructed in Aus-lia, only two reservoirs in Brisbane have suf-ed serious corrosion problems. (Sims-ISWS)
6-02535

EMBRANE EVAPORATOR/SUBLIMATOR VESTIGATION,
Research Mfg. Co., Los Angeles, Calif.
primary bibliographic entry see Field 3A.
6-02538

EMBRANE HUMIDITY CONTROL IN-STIGATION,
Research Mfg. Co., Los Angeles, Calif.
primary bibliographic entry see Field 3A.
6-02539

E OF DOMESTIC WASTE GLASS FOR BAN PAVING, SUMMARY REPORT,
souri Univ., Rolla. Dept. of Civil Engineering.
primary bibliographic entry see Field 5E.
5-02657

DY OF CORROSION PRODUCTS IN THE TTLE WATER DEPARTMENT TOLT DIS-BUTION SYSTEM,
onal Environmental Research Center, Gig bor, Wash. Northwest Water Supply Research

For primary bibliographic entry see Field 5A.
W76-02660

CALCULATION OF ICE-COVER BENDING ALLOWING FOR VISCOUS PROPERTIES OF ICE,
For primary bibliographic entry see Field 2C.
W76-02911

EVALUATION OF THE STRENGTH AND SEAKEEPING ABILITY OF POLLUTION CONTROL BARRIERS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-02929

8I. Fisheries Engineering

FISH LADDERS FOR JOHN DAY DAM, COLUMBIA RIVER, OREGON AND WASHINGTON,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
R. L. Johnson, and L. Z. Perkins.
Available from the Natonal Technical Information Service, Springfield, Va 22161 as ADA-000 332, $5.50 in paper copy, $2.25 in microfiche. Technical Report No 103-1, December 1968. 108 p, 17 fig, 35 plates, 14 tab, 1 ref.

Descriptors: *Fish ladders, *Model studies, *Hydraulic models, *Columbia River, Dams, Hydraulic structures, Weirs, Fish passages, Fish handling facilities, Fish management, Fish migration,Structures, Rivers, Hydraulic engineering, Laboratory tests.
Identifiers: *John Day Dam(Ore Wash).

Facilities for passing fish upstream over John Day Dam include a powerhouse collection system with fishway entrances at each end and along the downstream face of the powerhouse, and a 24-ft-wide fish ladder with 1-on-10 slope on both sides of the river. The north fish ladder (except entrance section) and a portion of ladder adjacent to the south fish counting were studied in a 1:10-scale model. A group of four typical diffusion chambers in each ladder was reproduced in a 1:8-scale model. Fishway weirs with 6-ft-long overflow crests at each end of a 12-ft-long nonoverflow section, upstream fins, and 18-by18-in. orifices at the floor were adopted. Orifice sizes in the regulating sections were adjusted to control discharge and head drops between 19 nonoverflow bulkheads for an 11-ft range in forebay levels. Sloping floors, baffle beams at a constant elevation, and metering orifices sized to provide 60 cfs each were selected for diffusers in sloping portions of the fish ladders. Improved designs were developed for the bulkhead and weir adjacent to the north fish counting station. The addition of a third orifice in bulkheads of the regulating section (to assist passage of shad and sockeye salmon) increased turbulence at the north fish counting station. The south fish counting station, with an illuminated vertical counting board, was satisfactory after the orifices in the adjacent downstream weir were enlarged to reduce head on the weir. (Sims-ISWS)
W76-02537

MODIFICATION OF FISH LADDERS, BONNEVILLE DAM, COLUMBIA RIVER, OREGON AND WASHINGTON,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
L. Z. Perkins, and P. M. Smith.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-000 341, $5.50 in paper copy, $2.25 in microfiche. Technical Report No. 141-1, December 1973. 102 p, 11 fig, 38 plates, 4 tab.

Descriptors: *Fish ladders, *Bonneville Dam, *Model studies, Dams, Hydraulic structures, Weirs, Flow control, Fish passages, Fish handling facilities, Fish management, Fish migration, Management, Structures, Columbia River, Rivers, Hydraulic models, Hydraulic engineering, Laboratory tests.
Identifiers: Fish counting stations.

Modifications of the flow control sections and counting stations of the Bradford Island and Washington Shore fish ladders at Bonneville Dam were necessary to accommodate rapid pool changes which will result from fluctuating discharges caused by power peaking at hydroelectric projects upstream. Fishway operation for the extreme flood control pool range from elev 70.0 to elev 82.5 (feet above mean sea level) was considered. The normal range for design was between elev 72.0 and 80.0. A portion of the forebay, the exit control section, the counting station, the supply channel for auxiliary water, and typical sections of each ladder were studied in a 1:14-scale model. Hydraulically satisfactory designs for automatic control systems with vertical-slot nonoverflow walls, bleed-off and add-in diffusers, auxiliary water supply, movable-board underwater counting stations, and revised overflow weirs downstream were developed in the model. The designs for both ladders were operative with forebay levels between elev 70.0 and 76.5. Relatively simple modifications of those designs that could extend their range of operation to pool elev 80.0 were also developed. None of the plans was adequate at pool elev 82.5. (Sims-ISWS)
W76-02547

PRINCIPLES OF WATER QUALITY MANAGEMENT--11. FISHERIES AND AMENITY REQUIREMENTS,
Thames Conservancy, London (England).
H. Fish.
Effluent and Water Treatment Journal, p 586-597, September 1973, 12 ref.

Descriptors: *Protection, *Management, *Fisheries, *Water quality, Water pollution effects, Sport fishing, Freshwater fish, Marine fish, Salmonids, Europe, Anadromous fish, Catadromous fish, Recreation, Limiting factors.
Identifiers: England, Wales.

Management requirements of water quality of freshwater and marine fisheries in the United Kingdom are outlined for migratory and rough fish (salmon, trout, eels, and cyprinid coarse fish). Two major physical requirements of freshwater fisheries are suitable water temperature and its ability to transmit light, the latter necessary for sustaining the fishery's food supply. The effects of dissolved oxygen, carbon dioxide, pH, suspended solids, ammonia, phenols, cyanides, heavy metals, cadmium, and pesticides, are described. Tentative fish management guidelines for toxic constituents in water are that they should not exceed between 0.02 and 0.2 LC-50 (48 hours); that is, not greater than 0.02 for salmon and trout fisheries; not greater than 0.05 for very good trout and coarse fisheries; not greater than 0.1 for reasonably mixed coarse fisheries; and not greater than 0.2 for coarse fisheries of relatively low value in terms of fish sizes and variety of species. The major concern of water quality management for the protection of sea fisheries in estuarine and coastal waters is the control of pollution, the maintenance of an adequate oxygen saturation, the protection from the effects of heated discharges, and toxic and tainting substances. The amenity requirements for various recreational activities are also discussed. (Auen-Wisconsin)
W76-02653

A MODEL OF ALEWIFE MIGRATION IN THE PARKER RIVER, MASSACHUSETTS FOR

Field 8—ENGINEERING WORKS

Group 8I—Fisheries Engineering

SIMULATING AN OPTIMAL ANADROMOUS FISH STOCK MANAGEMENT PROGRAM,
Massachusetts Univ., Amherst. Water Resources Research Center.
G. Libey, C. F. Cole, and J. E. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 405, $4.00 in paper copy, $2.25 in microfiche. Water Resources Research Center Pub No 57, Completion Report FY-76-4, Sept 1975. 25 p, 4 fig, 3 tab, 22 ref. OWRT A-054-MASS(1). 14-31-0001-5021.

Descriptors: Fish management, *Fish stocking, *Fish migration, *Massachusetts, *Anadromous fish, Model studies.
Identifiers: *Alewife migration, Parker River(Mass).

Biological and physical data were collected on anadromous alewife (Alosa pseudoharengus) migration into the Parker River, Essex County, Massachusetts. These data were the basis for constructing a model of the migration. The model, when fully developed, will provide a sufficiently realistic simulation that can be utilized by regulatory agencies as an aid in anadromous fish stock management in the Parker River and similar rivers elsewhere.
W76-02868

10. SCIENTIFIC AND TECHNICAL INFORMATION

10D. Specialized Information Center Services

ENGINEERING DESIGN HANDBOOK, ENVIRONMENTAL SERIES, PART ONE, BASIC ENVIRONMENTAL CONCEPTS.
Army Materiel Command, Alexandria, Va.
For primary bibliographic entry see Field 06G.
W76-02550

CHRIS APPENDIXES I-VI. (PRELIMINARY SYSTEMS DEVELOPMENT-CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM-CHRIS)
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05A.
W76-02552

THE ARIZONA RESOURCES INFORMATION SYSTEM - 1975,
Arizona Resources Information System, Phoenix. Dept. of Revenue.
For primary bibliographic entry see Field 06B.
W76-02736

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- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
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